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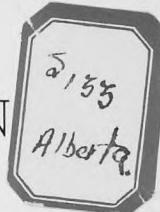
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DEPARTMENT OF AGRICULTURE
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DOMINION EXPERIMENTAL STATION
LACOMBE
ALTA.

G. E. DeLONG, B.S.A., M.Sc., SUPERINTENDENT

PROGRESS REPORT
1937-1946



YORKSHIRE PIGS AT
DOMINION EXPERIMENTAL STATION,
LACOMBE, ALTA.

Published by authority of the Rt. Hon. JAMES G. GARDINER, Minister of Agriculture,
Ottawa, Canada.

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INTRODUCTION

The Dominion Experimental Station at Lacombe, Alberta, was established in 1907. It serves an area in central Alberta which includes three major regions: the foothills, the park belt and the prairie. The area lies between the Rocky Mountains on the west, the Saskatchewan border on the east, Calgary on the south and the Athabasca district and river on the north. The Lacombe Station is situated in the black soil zone. Its district comprises southern grey woodland, black, dark brown and brown soil zones. Administered from Lacombe are three District Experiment Substations and six Illustration Stations which are located on representative soil types.

Experimental work is being conducted at this Station in many important phases of livestock, grain and diversified farming. The most important livestock work at Lacombe is with Yorkshire swine. A large herd is kept with which breeding, feeding, management, housing and sanitation experiments are conducted. Attention has been focussed on the study of the mode of inheritance of desirable carcass characteristics, prolificacy and growthiness, in order to develop lines prepotent in these respects. An excellent herd of Shorthorn cattle is maintained as well as purebred Clydesdale horses. Poultry work is conducted with the White Wyandotte and New Hampshire breeds, the latter flock being started in 1946.

Extensive experiments are undertaken with cereal grains and forage crops at the Lacombe Station. Long-time crop rotation experiments have been conducted since 1911 comparing grain with mixed farming rotations. The value of farm manure and various commercial fertilizers is being studied.

Experiments in horticulture at this Station are aimed to supply reliable information to Alberta farmers as to the most suitable varieties of fruits, vegetables, flowers, shrubs and trees and how to grow them.

The previous progress report from the Lacombe Experimental Station was published in 1938, covering the results of experiments for the years 1932 to 1936, inclusive.

F. H. Reed, who had been Superintendent at Lacombe Experimental Station since 1920, retired in 1946 and was succeeded by G. E. DeLong as Acting Superintendent and, in 1947, as Superintendent. The material presented in this report was prepared for publication by the present Superintendent and staff at Lacombe.

METEOROLOGICAL RECORDS

Much of the soil in the area served by the Lacombe Station is such that heavy yielding crops are possible, provided uncontrollable factors such as temperature and precipitation are favourable.

Meteorological observations have been recorded since 1908 (39 years). The data compiled will give a general knowledge of the climatic conditions prevailing in central Alberta, and constitutes a background for predicting what may be expected in the future. The data presented in the accompanying tables indicate the climatic conditions which may be expected.

The average rainfall over the 39-year period, 1908-1946, during the four crop production months of May, June, July and August totals 10.71 inches, which is slightly over sixty per cent of the annual average total precipitation of 17.73 inches. Relatively high temperatures and long hours of sunshine also prevail during these same months, hence maximum crops are produced from the available moisture. The above combination of weather, results in the area served by the Station being a reasonably safe cropping district.

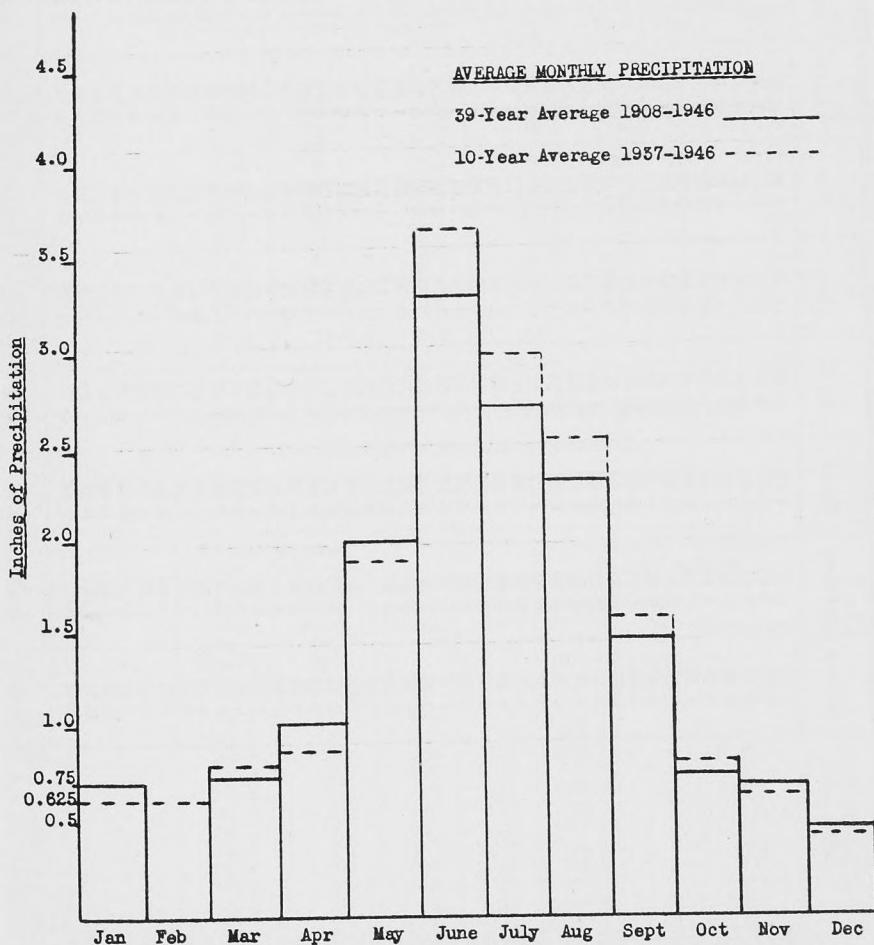


Fig. 1—Distribution of precipitation, Lacombe, Alta.

TABLE 1.—PRECIPITATION
Dominion Experimental Station, Lacombe, Alta.
1908-1946.

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total	
1908.....	0.20	0.97	1.06	0.26	3.56	6.46	1.88	1.73	0.31	0.40	0.25	0.37	17.08	
1909.....	0.72	0.30	0.35	0.28	2.41	1.99	3.85	0.91	0.43	1.05	0.75	13.41	13.38	
1910.....	0.73	0.74	0.33	0.04	1.63	3.87	1.35	2.61	1.00	0.27	0.51	0.30	20.60	
1911.....	0.55	0.48	1.01	1.15	1.51	4.79	4.39	2.63	2.50	0.62	0.78	0.19	21.83	
1912.....	0.76	0.16	0.13	1.29	2.92	3.00	5.29	4.44	1.27	1.56	0.93	0.08	14.29	
1913.....	1.53	1.15	0.81	0.15	0.48	2.98	3.43	2.44	0.59	0.68	0.05	0.98	18.29	
1914.....	1.45	1.00	0.80	0.34	1.28	6.07	1.11	1.10	2.36	0.30	1.50	0.98	16.82	
1915.....	0.30	0.03	0.30	0.30	1.25	7.77	3.37	0.84	1.33	0.53	0.30	0.45	22.96	
1916.....	0.40	1.38	0.52	0.60	2.04	3.57	4.31	5.22	3.06	1.01	0.40	1.30	15.94	
1917.....	0.75	0.32	0.33	1.24	3.26	1.49	1.13	1.89	2.04	1.36	0.62	1.20	17.09	
1918.....	0.53	0.15	0.30	4.60	0.94	1.47	1.94	3.93	1.13	0.64	1.18	0.62	17.73	
1919.....	0.30	0.82	0.77	2.30	3.14	1.03	2.32	1.64	2.33	0.64	0.72	0.01	15.22	
1920.....	0.40	1.34	0.40	2.23	1.61	1.81	1.52	0.38	1.56	0.72	0.24	0.23	13.61	
1921.....	0.68	0.42	1.39	2.61	1.69	1.85	3.28	0.98	1.49	0.60	0.29	0.18	18.41	
1922.....	0.91	0.72	0.30	1.07	1.30	1.75	1.88	2.94	0.84	0.52	0.26	0.65	20.24	
1923.....	0.20	0.50	0.66	1.55	2.04	4.30	3.81	3.57	0.84	1.20	0.50	0.18	17.36	
1924.....	0.80	0.88	1.06	1.65	0.97	0.82	4.21	1.95	0.79	2.66	0.65	0.90	19.24	
1925.....	0.35	0.40	0.45	0.72	1.53	2.01	1.32	3.87	3.37	1.00	1.44	0.90	17.36	
1926.....	1.10	1.13	0.88	0.39	3.44	2.02	2.66	5.02	3.86	0.62	1.49	0.98	23.59	
1927.....	0.33	1.27	2.08	0.63	2.84	3.42	5.36	1.76	2.35	2.13	2.42	25.21	Janua	
1928.....	0.25	0.37	0.56	1.70	0.50	7.30	1.66	2.56	0.74	0.18	0.32	16.15	Februa	
1929.....	0.96	1.05	0.60	1.70	1.42	1.35	0.63	1.52	0.63	0.21	1.80	1.05	March	
1930.....	0.20	0.17	0.22	1.27	1.61	2.08	3.72	2.93	1.19	0.85	0.35	0.30	April	
1931.....	0.02	0.02	1.40	0.05	0.85	8.11	2.59	2.53	1.12	0.38	0.70	0.70	May	
1932.....	0.32	1.10	0.67	4.61	2.08	3.97	2.30	1.84	2.77	1.50	0.40	22.81	June	
1933.....	0.65	1.77	0.80	0.67	2.00	2.06	2.93	1.01	0.66	1.36	1.02	1.47	July	
1934.....	0.66	0.12	0.88	0.93	2.27	2.50	1.38	1.24	2.09	0.62	0.53	13.17	Augus	
1935.....	1.50	0.10	0.72	2.65	4.13	4.09	3.10	1.85	1.31	1.40	1.25	0.73	Septem	
1936.....	1.00	0.60	1.60	0.85	2.58	1.92	2.03	1.91	1.05	0.59	0.62	0.62	Octobe	
1937.....	0.88	0.08	0.49	0.40	1.28	2.25	5.28	3.55	3.28	0.25	0.85	0.69	Novem	
1938.....	0.60	0.45	0.38	1.18	2.19	1.70	2.48	4.71	0.33	1.16	0.51	0.17	Decem	
1939.....	0.66	1.25	1.00	2.26	2.43	4.61	1.56	0.29	1.90	2.22	0.22	0.05	Janua	
1940.....	0.61	0.37	2.29	3.21	1.92	1.80	2.83	0.52	0.67	1.50	1.15	0.63	Februa	
1941.....	0.78	0.48	0.86	0.07	1.92	6.16	1.92	3.13	1.42	0.81	0.51	0.18	March	
1942.....	0.14	0.55	0.29	1.52	2.11	5.33	4.50	2.71	2.26	0.44	1.91	0.53	April	
1943.....	1.01	0.70	0.95	0.58	1.62	3.06	2.10	3.62	0.58	0.91	0.04	0.37	May	
1944.....	1.33	1.43	0.48	4.37	4.99	6.13	1.87	2.95	0.27	0.87	0.15	0.44	June	
1945.....	0.79	0.57	0.39	1.46	2.00	2.59	4.58	2.72	0.98	0.98	1.50	21.06	July	
1946.....	0.59	0.47	0.44	0.74	1.10	5.81	2.16	2.13	1.93	0.62	1.55	0.80	18.34	Augus
39-Year Av. 1908 to 1946 inclusive.....	0.65	0.64	0.78	1.21	2.01	3.44	2.84	2.42	1.60	0.77	0.71	0.66	17.73	Septem

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On the other hand, crop production is frequently limited by climatic extremes. A better knowledge of the climate of central Alberta can be gained from the extremes recorded during the 39 years meteorological records have been kept. These records are summarized in the following paragraphs.

TEMPERATURES

The occurrence of frost and the duration of frost-free periods is given in Tables 4 and 5. Data giving the last spring and the earliest autumn date when temperatures of 29 degrees F. were recorded are presented in Table 4 and the last spring and the earliest autumn date when temperatures of 32 degrees F.

TABLE 2.—TEMPERATURES

Dominion Experimental Station, Lacombe, Alta.
1908-1946.

Month	39-year average temperatures, 1908-1946 (Degrees Fahrenheit)								
	Average monthly temperatures			Highest temperatures recorded by months			Lowest temperatures recorded by months		
	Mean maximum	Mean minimum	Mean monthly	Tempera-ture	Year	Day	Tempera-ture	Year	Day
January.....	20.6	-4.6	8.0	60.0	1931	29	-54.3	1909	8
February.....	26.0	-1.0	12.4	64.2	1923	28	-49.3	1936	16
March.....	37.3	10.1	23.4	69.0	1942	31	-39.0	1932	7
April.....	52.5	25.6	39.2	87.0	1939	29	-24.1	1920	2
May.....	63.4	35.2	49.3	92.0	1936	27	12.4	1919	4
June.....	67.5	42.7	55.6	99.5	1937	29	22.0	1931	3
July.....	75.6	46.8	61.3	100.8	1924	2	29.9	1921	10
August.....	73.4	43.5	58.5	98.0	1929	28	25.0	1934	24
September.....	64.3	35.4	49.8	90.0	1943	25	5.0	1926	24
October.....	54.5	25.8	40.2	90.0	1943	2	-11.5	1925	28
November.....	36.6	12.3	24.5	74.0	1931	1	-34.6	1919	30
December.....	25.1	1.5	13.3	64.0	1941	31	-57.0	1924	17
Annual.....	49.7	22.8	36.3	101	.....	.....	-57	.....	.....

TABLE 3.—SUNSHINE, WIND AND EVAPORATION

Dominion Experimental Station, Lacombe Alta.

Month	Sunshine			Wind				Evaporation	
	39-year average		Number of years	Direction of prevailing wind by months			Average in inches	Number of years	
	Average total hours for month	Average total hours for day		Average number of miles	Number of years	Direction			
January.....	84.4	2.7	4.9	22	1,368.0	5	S	.....	.....
February.....	121.3	4.3	5.0	22	976.2	6	S	.....	.....
March.....	161.4	5.2	5.9	22	1,200.7	6	S	.....	.....
April.....	206.2	6.9	6.8	22	784.2	6	S	1.17	13
May.....	237.5	7.6	7.0	21	992.0	5	NW	3.37	17
June.....	251.4	8.4	6.6	21	790.2	6	NW	3.06	18
July.....	296.5	9.6	6.0	20	675.2	5	N	3.88	19
August.....	264.7	8.7	5.2	21	1,013.2	3	NW	3.41	18
September.....	183.7	6.1	5.8	22	1,138.4	5	NW	1.91	18
October.....	150.0	4.9	6.2	20	1,456.7	4	S	.84	15
November.....	99.9	3.3	5.4	22	1,324.6	5	S	.....	.....
December.....	76.2	2.4	5.5	21	1,416.8	6	S	.....	.....
Annual.....	2133.2	.....	5.9	.....	.....	.....	17.64	.....	.....

were registered are presented in Table 5. It will be seen that the average number of growing days for moderately resistant crops which will tolerate three degrees of frost before they are damaged is 106.8 days, for crops which have no frost resistance one can expect to have only 79.0 frost-free days in which to develop.

The lowest temperature recorded at the Station was 57.0 degrees below zero, registered on December 17, 1924; the highest recorded was 100.8 degrees registered on July 2, 1924.

During the 39 years meteorological observations have been recorded, the last spring frost occurred nine years in May, twenty-seven years in June and three years in July. Early fall frosts occurred two years in July, twenty-three years in August and fourteen years in September.

PRECIPITATION

The average annual precipitation for the thirty-nine year period is 17.7 inches. The average precipitation for the six-month period April to September

TABLE 4.—THE OCCURRENCE OF FROST AND FROST-FREE PERIODS

Dominion Experimental Farm, Lacombe, Alta.
1908-1946 (39 years)
(Freezing Temperature 29 degrees F.)

Year	Date of last frost in spring	Date of first frost in fall	Days frost-free
1908.....	May 5	August 21	108
1909.....	May 19	August 28	101
1910.....	June 3	Sept. 9	98
1911.....	May 28	August 27	91
1912.....	June 5	Sept. 14	101
1913.....	May 18	Sept. 7	112
1914.....	May 29	Sept. 1	95
1915.....	May 1	Sept. 11	133
1916.....	June 3	August 10	68
1917.....	June 3	Sept. 5	94
1918.....	June 3	Sept. 2	91
1919.....	June 11	Sept. 1	81
1920.....	June 13	August 30	78
1921.....	May 26	August 25	91
1922.....	June 8	Sept. 5	89
1923.....	May 24	Sept. 11	110
1924.....	June 23	August 31	69
1925.....	May 12	Sept. 20	131
1926.....	June 10	Sept. 8	90
1927.....	May 26	Sept. 14	111
1928.....	May 11	August 23	104
1929.....	June 20	Sept. 5	77
1930.....	May 24	Sept. 15	154
1931.....	May 22	Sept. 17	118
1932.....	May 26	Sept. 2	99
1933.....	June 11	Sept. 17	98
1934.....	May 23	August 23	92
1935.....	May 13	Sept. 3	113
1936.....	May 12	Sept. 11	122
1937.....	May 30	Sept. 23	116
1938.....	May 19	Sept. 29	133
1939.....	June 1	Sept. 9	100
1940.....	May 5	Sept. 23	141
1941.....	May 20	Sept. 8	111
1942.....	May 19	Sept. 17	121
1943.....	May 18	Sept. 2	107
1944.....	May 11	Sept. 18	130
1945.....	May 21	Sept. 29	131
1946.....	May 24	Sept. 17	116
Average.....			106.8

rain 13.52 inches or 76 per cent of the yearly average. This explains why such abundant crops are produced from the relatively low average total annual precipitation.

June, 1928, was the wettest month on record when 7.30 inches of rain fell. It was preceded by a very dry May and was followed by a very dry July. Central Alberta experiences very dry and very wet years. Drought conditions prevailed in 1910 when 13.38 inches of precipitation occurred, again in 1920 with 12.73 inches, 1921 with 15.22 inches, and in 1922 with 13.61 inches; then 1929 with 12.92 inches, 1930 with 14.89 inches, 1933 with 14.47 inches and 1934 with 13.17 inches. Nine of the past thirty-nine years were considered "dry" years, with over twenty inches precipitation. These were the years 1911, 1912, 1916, 1927, 1932, 1935, 1942, 1944 and 1945.

SUNSHINE

The months having the most sunshine also have the highest temperatures and the most rainfall. The high temperatures result in frequent thunderstorms which are responsible for a considerable proportion of the rainfall during the

TABLE 5.—THE OCCURRENCE OF FROST AND FROST-FREE PERIODS

Dominion Experimental Farm, Lacombe, Alta.

1908-1946 (39 years)

(Freezing Temperature 31 degrees F.)

Year	Date of last frost in spring	Date of first frost in fall	Days frost-free
08.	June 27	August 21	55
09.	June 29	August 23	55
10.	June 23	August 23	58
11.	May 29	August 27	90
12.	June 6	August 30	85
13.	May 18	July 24	67
14.	May 29	Sept. 1	95
15.	June 13	Sept. 11	90
16.	June 7	August 10	54
17.	June 10	July 30	50
18.	June 3	Sept. 2	91
19.	July 3	August 14	42
20.	July 13	August 30	48
21.	July 10	August 24	45
22.	June 8	Sept. 5	89
23.	May 24	August 1	69
24.	June 24	August 31	68
25.	June 6	August 22	77
26.	June 10	Sept. 8	90
27.	May 26	Sept. 9	106
28.	June 1	August 23	83
29.	June 24	Sept. 4	72
30.	June 4	August 31	88
31.	June 4	Sept. 13	101
32.	June 5	August 31	87
33.	June 11	August 20	70
34.	June 7	August 23	77
35.	June 6	August 26	81
36.	June 4	Sept. 9	97
37.	June 10	August 28	79
38.	June 7	August 23	77
39.	June 7	August 19	73
40.	May 5	Sept. 18	136
41.	May 23	Sept. 8	108
42.	June 22	Sept. 16	86
43.	June 7	August 18	72
44.	May 23	Sept. 18	118
45.	June 29	August 19	51
46.	May 24	Sept. 7	106
Average			79.0

growing season. While more hours of sunshine are recorded during the summer months, there is considerable sunshine during the wintermonths. Cold winter weather is usually accompanied by bright sunshine while warm winter weather results from chinook winds and clouds which constitute the chinook arch.

WIND VELOCITY

Wind velocity records have been kept since 1923. These data show the high velocity winds which create serious soil drifting problems and cause excessive evaporation from the soil and transpiration from the growing plants and not prevalent.

Fair weather winds of central Alberta are usually from the northwest. Chinook winds are usually from the southwest and frequently precede storms. The chinook winds, being warm winter winds, usually moderate winter temperatures, but seldom remove the snow covering in the district north of Olds.

ANIMAL HUSBANDRY

H. E. Wilson and H. T. Fredeen

HORSES

At this Station about thirty purebred Clydesdale horses are kept for work and for experimental studies in breeding, feeding, housing and management. The main project, however, is to produce a supply of high class foundation breeding stock, particularly young sires, for the improvement of the horse industry.

During the year 1935, recognizing the need for some assistance to horse breeding, the Dominion Department of Agriculture placed for service at this institution, the imported three-year-old Clydesdale stallion Strathore James (No. 26996 (22340)). He was sired by Woodbank Majestic No. 21393 and out of a "Botha" dam. This stallion was of the thick, draughty cart-horse type with plenty of bone of good quality. He stood for service at the Lacombe Station for six consecutive breeding seasons and during that period was bred to a total of 309 mares, some of which were brought in from great distances for service. He left a number of excellent foals, both in the Station stud and in the surrounding districts.

In the spring of 1941, Strathore James was transferred to the Dominion Experimental Farm, Indian Head, Sask., and was immediately replaced by the twelve-year-old imported stallion, Windlaw Gayman No. 26992 (21933) received from the Central Experimental Farm, Ottawa. Windlaw Gayman was sired by Dunbritton Sensation (21479) who in turn was got by the famous champion Fyvie Sensation (20042), the sire of the leading breeding and show horse of the past decade, Benefactor (20867). His dam, Branchal Lady Buchlyvie (42138) was got by the \$47,500 Baron of Buchlyvie (11263). The sire and dam combined the best Clydesdale strains in Scotland. In addition to being well bred, he was a good individual with plenty of size, strength and substance, and good strong, clean, hard bone.



Fig. 2—A six-horse team of registered Clydesdales bred at the Dominion Experimental Station, Lacombe, Alta.

Windlaw Gayman stood for service at the Lacombe Station during the seasons of 1941, 1942 and 1943 under the breeding policy laid down by the Dominion Department of Agriculture, which gave special consideration to owners of high-class purebred mares. During the three breeding seasons he served a total of 104 mares.

During the year 1944 there was an addition made to the stud of Clydesdales—a nineteen-year-old imported stallion, Craigie Maxwell No. 2549 (21321) presented as a gift to this Station by R. A. Allan of Dalroy, Alta.

The pedigree of this horse is most interesting. In the four generations of his ancestry, the famous horse, Baron's Pride, appears twice, Baron of Buchlyvie appears three times, and Bonnie Buchlyvie twice. His dam is the grand daughter of the famous horse, Hiawatha, which was four times awarded the Cawdor Cup. Craigie Maxwell's sire, Craigie McQuaid, is a Cawdor Cup and Brydon Shield winner, and in 1924 and 1925 was supreme champion at the Glasgow Summer Show.

Horse breeding activity on the part of breeders was very light during the 1944, 1945 and 1946 breeding seasons. As a consequence, only 88 mares were bred to the two Clydesdale stallions, Craigie Maxwell and Lacombe Reliance No. 29113—a son of Stratore James—during this period.

SHORTHORN CATTLE

INTRODUCTION

A foundation herd of purebred Shorthorn cattle was established in the year 1932 with cattle received from the Dominion Experimental Farm at Indian Head, Sask., and the Dominion Experimental Station at Swift Current Sask. In February, 1934, an additional five head of purebred Shorthorn females were purchased from a private breeder. The total number of foundation females transferred and purchased to establish the purebred Shorthorn herd at Lacombe was 45 head. The herd has been increased and, at time of writing, with 33 breeding females, 2 sires and 28 heifers and calves, totals 63 head. Growth of the herd, with the exception of the introduction of herd bulls has been by natural increase only. Outbreaks of abortion necessitated the slaughtering of many animals and this partly explains why the herd has grown slowly in number.

MANAGEMENT POLICY

Until recently, the Shorthorns at this Station have been developed along two lines—beef and dual-purpose. They have been carefully selected to maintain true Shorthorn type and character combined with large well-shaped udders and good milking qualities. During the period covered by this report, the females that gave some indication of a reasonable milk flow were tested as early as possible for milk production in the Record of Performance, usually as two-year-olds. All other females plus those that did not qualify in the R.O.P. were transferred to the beef section of the herd. This section of the herd was run on a semi-range basis, each cow suckling her own calf and occasionally that of one of the cows in the milking herd as well.

RECORD OF PERFORMANCE

The Canadian Record of Performance for purebred cattle conducted by the Production Service of the Dominion Department of Agriculture is a test that is regarded as a practical measure of the producing capacity of purebred cows.

The two principal divisions of the Record of Performance test are:

- (1) 365-day division.
- (2) 305-day division.

Normal cows and heifers that had not previously been tested or that gave promise of bettering previous records were entered in the Record of Performance as soon as they freshened. The 305-day record was the objective as it resembles more closely ordinary farm conditions, since it permits a cow to milk for approximately ten months, take a six to eight weeks' dry period and freshen again at about one year. The 305-day division carries with it a 400-day calving limit, which means that the cow must drop a normal calf within 400 days after the beginning of the test lactation. Where the cows and heifers in the herd did not hold to a service early enough to have them drop a calf within the time limit for the 305-day division, they were carried on for the 365-day record.

Forty-four cows and heifers completed R.O.P. tests during the years from 1933 to 1945 inclusive. During this thirteen-year period, the 44 females gave an average production of 7,585 pounds of milk and 307 pounds of fat in 332 days. The average fat content was 4.05 per cent.

Sires Used in the Herd

The following is a list of the more recent sires used in the herd in the order in which they have been acquired:

Coldoch Rosewood King (Imp) —219903— was obtained through the Central Experimental Farm, Ottawa, Ont., in the spring of 1938 and was used continuously until March, 1942, with the result that a large part of the herd is now made up of his daughters and grand-daughters. His sire was Kinellar Obligant (258299) and his dam the great breeding and show cow, Coldoch Rosewood (143325). This cow was first at both the Royal and Highland Agricultural Society Shows in the year 1934 and was a beautifully moulded cow and an outstanding milker. This imported bull, red in colour, being of good beef conformation helped to maintain a good type of beef animal in the herd capable of producing a reasonable quantity of milk.

Balgerran Drover —242012— a red, low-set animal with an excellent beef conformation was purchased from the herd of Hugh L. Sharp, Lacombe, Alta., in the fall of 1941. He bred well to the daughters of the imported bull, Coldoch Rosewood King, leaving a nice group of both bull and heifer calves.

Killearn Monarch 25th —257402— was purchased in January, 1944, from Claude Gallinger of Tofield, Alta., for \$3,000. His sire is the imported bull, Pittodrie Monarch —229862—. He is an extremely smooth, low-set well balanced bull of excellent breed character. He is mating well with the females in the Lacombe herd and will probably prove to be an outstanding sire.

Lacombe Monarch 7th —278471—, born April 18, 1945, a son of Killearn Monarch 25th, was used on ten of his half-sisters during the 1946 breeding season. This half-brother and half-sister mating should provide a good test of the breeding abilities of this young sire.

Milk Production and Feed Consumption Records

For the 13-year period, 1933-1945, feed cost records were kept in conjunction with the daily R.O.P. production records maintained for each cow. Data on 98 lactations were obtained and are summarized in Table 6.

Management of this herd was consistent with the normal conditions prevailing in central Alberta. A meal mixture consisting of four parts oat chop, one part bran and one part oilmeal was fed throughout the year at a daily rate determined by the milk flow of individual cows. During the winter, the

TABLE 6.—THIRTEEN-YEAR AVERAGE FEED CONSUMPTION RECORDS FOR MILK AND BUTTERFAT PRODUCTION BY A DUAL-PURPOSE SHORTHORN HERD.

Number of lactations	Average number of days in milk	Average production per lactation lb.	Per cent fat	Average fat production per lactation lb.	Average feed requirements lb.			Average days pasture
					Hay	Ensilage	Grain	
98	331	6,497	4.10	265	3,966	9,119	1,527	155

daily ration was 30 to 35 pounds of silage and 10 to 15 pounds of mixed hay containing a high percentage of alfalfa in addition to the meal. At no time were any of the cows given special rations to encourage an absolute maximum milk flow. The object was to keep production consistent with economy.

These figures may provide some indication as to the milk production to be expected of a herd of Shorthorns maintained under average farm conditions in central Alberta. They may also be used in the calculation of feed costs based on the going prices for the feeds that are used.

SALES OF BREEDING STOCK

During the period of this report, sales have consisted largely of young breeding bulls to farmers and breeders in outlying districts. In addition, a number of breeding bulls have been supplied to various branch Experimental Farms and Stations as herd sires, thus carrying out the policy of supplying necessary new blood from within the Dominion Experimental Farms system and at the same time making possible the carrying out of a planned line-breeding policy.



Fig. 3.—The Shorthorn herd sire at the Dominion Experimental Station, Lacombe, Killearn Monarch 25th.

As a result of the disposal of reactor animals to the blood test for contagious abortion and the rigid selection and weeding out of females in the process of improving type and quality, the herd has been so badly depleted that the sales of breeding stock, particularly females, have been greatly curtailed.

DISEASE CONTROL

The herd is free from tuberculosis and is fully accredited.

The project on the control of contagious abortion being carried on in co-operation with the Division of Animal Pathology, Science Service, has been one of the major projects conducted during the period under review.

All animals are subjected to the blood agglutination test to determine the presence of infection from *Bacillus abortus*, the causative agent of Bang's disease. The results of the annual tests conducted during the years 1937 to 1944, inclusive, did not reveal any certain evidence of infection, there being no animals in the herd during that time that gave a positive reaction. While during this eight-year period a total of six animals gave reactions of a questionable nature, there were no abortions. However, there may have been females in the herd that were harbourers of the germ of the disease. These animals may have been the means of infecting other animals with less resistance as a serious outbreak of contagious abortion occurred during the early summer of 1945 and before the end of the year 25 per cent of the calves dropped were abortions. The results of a serological test of the herd revealed 21 positive and 14 questionable reactors out of a group of 56 animals tested which did not include 14 calves under six months. This represented approximately 63 per cent infected animals in those over six months of age. As this indicated a very virulent type of infection, it was decided to drop the Bang's Disease Control Policy as operated by the Dominion Health of Animals Division and substitute a Calfhood Vaccination Policy using strain 19 vaccine from the Animal Diseases Research Institute, Hull, Que. Heifers over eight months of age, cows and bull calves were not vaccinated. Any reacting animals over two years of age were tattooed with the letter "B" in the right ear. Arrangements were made with the District Veterinary Inspector, Dominion Health of Animals Division, to periodically test the adult portion of the herd in order to furnish information as to the status of the herd under the new policy.

Two serological tests conducted during the year 1946 gave further proof of the infectious nature of this insidious disease. The results of these tests revealed that approximately 86 per cent of the animals in the herd over six months of age gave either positive or questionable reactions. Forty-four per cent of the calves dropped during the year were abortions indicating that the blood test may be looked upon as a fairly reliable guide in indicating individuals in a herd that are harbouring infection.

CALFHOOD VACCINATION

In co-operation with the Animal Pathology Division, Science Service, a project involving vaccination of the heifer calves between five to seven months with no segregation of the positive animals was commenced at this Station in September, 1945. This program was inaugurated in an effort to investigate the possibility of immunization against Bang's Disease. Vaccinated calves are expected to develop a resistance to the disease and remain healthy when kept in direct contact with infected animals.

Vaccination is accomplished by the injection of 10 cc. of live culture *Brucella abortus* vaccine, strain 19, which is prepared at the Animal Diseases Research Institute, Hull, Que. Calves are bled just prior to vaccination and

again thirty days later to secure blood samples for the agglutination tests conducted at the Veterinary Research Laboratory at Lethbridge, Alta. Calves which have been effectively vaccinated give a positive reaction to the test thirty days after vaccination. Those that fail to give a positive reaction at this time must be re-vaccinated.

Vaccination with strain 19 produces in the calves a mild type of the disease. However, since the injected organisms are of low virulence, it is hoped that the calves will be able to fight off the organism and at the same time build up an immunity within their bodies that will enable them to ward off infection from a more virulent strain of *Brucella abortus*.

At the close of the year 1946, seventeen heifer calves had been vaccinated.

The first thirteen females vaccinated as calves presented a rather unusual picture at the end of the year 1946 in that they showed positive and questionable reactions to the agglutination test approximately one year after vaccination. It was expected that the heifers ranging in age from 16 to 22 months would have built up an immunity at this age, thrown off the *Brucella abortus* organisms and then reacted negatively to the blood test.

This brings out the one factor in connection with vaccination of calves and that is that after they have been vaccinated and they react as these have done it is not known whether the reaction is due to the results of the vaccination or to the results of other infection. In this instance, the latter is likely to be the case since the majority of the animals in the Station herd are reactors and it is almost impossible to keep young females absolutely free of contact with the older infected animals. However, the fact that the females have been vaccinated as calves should give them some protection whether the infection they are carrying is the result of vaccination or re-infection.

It is proposed to continue this experiment until such time as all cattle in the herd will be those that were vaccinated as calves. This will require several years. The merits of this program will not be known until sufficient time has elapsed to permit vaccinated calves to grow to maturity and pass through several gestation periods. It is hoped that when the vaccinated females have gone through several pregnancies the value of the vaccine may be with some precision determined.

SWINE

Wartime demands on Canadian agriculture sent the hog population of Alberta skyrocketing to over 2,970,000 in the peak year of 1945—well over triple the number recorded for this province in 1936. Of this number a recent census indicated that over 70 per cent were produced in the area served by the Lacombe Experimental Station. With these figures in mind it is understandable that swine should continue to be one of the major divisions of livestock work at this station.

Work with swine at the Lacombe Station during the ten-year period following 1936 has been directed along several lines. Concurrent with a continuous improvement of the swine herd has been a program of research designed to study problems of nutrition, management, housing and sanitation. In recent years attention has been focussed on careful investigations of the mode of inheritance of carcass characteristics, prolificacy and growthiness and efforts are being made to develop lines of swine prepotent for these characteristics.

PRODUCTION OF BREEDING STOCK

Since the Lacombe Station was established it has been foremost in advancing Yorkshire type and performance. Continued improvement of breeding stock and production of quality foundation stock for swine breeders has been assured by a progressive policy in the selection of sows and boars used in the herd.

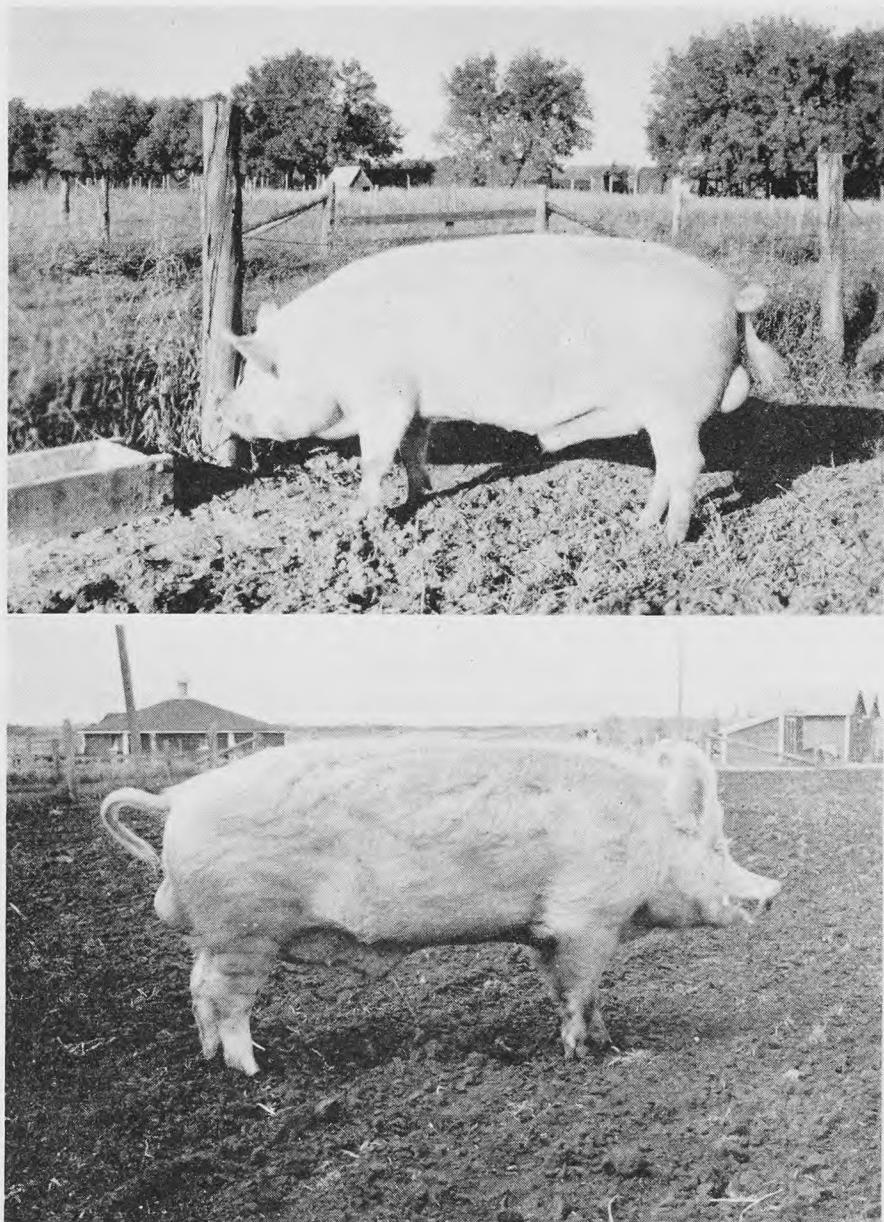


Fig. 4.—(Upper) Lacombe Beau 99A, a Yorkshire boar carrying a number of generations of Advanced Registry breeding, bred by and in service at the Dominion Experimental Station, Lacombe.

Fig. 5.—(Lower) Ste. Anne Malm 130R, a Yorkshire boar bred at the Dominion Experimental Station, St. Anne de la Pocatiere, Quebec, that has sired high scoring Advanced Registry progeny at the Lacombe Station.

Some indication of the policy followed in the breeding of this herd may be had by an examination of the blood lines introduced. Boards used have included "Malte of Svalof" (imp)—179619—, a Swedish Yorkshire; Weston Bob 18 (imp)—164676—, an English Yorkshire; St. Anne Malm 130R—192711—,

Fairholm 95T—212087— and Indian Head Beau 4W—240209—. All boars used have been tested in Advanced Registry and Table 6 sets forth some of the results obtained:—

TABLE 7.—ADVANCED REGISTRY RESULTS

Dominion Experimental Station, Lacombe, Alta.

Boar	No. of sows tested	No. of sows qualified	Average score of all tested sows		
			Production	Maturity	Carcass
Malte of Svalof (imp)—179619.....	7	6	55	114	75
Weston Bob 18 (imp)—164676.....	5	4	45	110	75
Ste. Anne Malm 130R—192711.....	14	12	47	107	86
Indian Head Beau 4W—240209.....	10	8	50	100	83
Fairholm 95T—212087.....	4	3	48	106	80
Evergreen Farm 12P—187515.....	5	4	47	108	83
Fairholm 46R—193173.....	6	4	55	112	75

Demand for breeding stock has always been keen and during the past years more than 1,500 head of boars and gilts have been placed with swine breeders from British Columbia to Nova Scotia. Sale of breeding stock has been made to government institutions as well as to farmers, and the foundation stock for many prominent herds in the Prairie Provinces and British Columbia was received from this Station.

PROLIFICACY

Prolificacy is an outstanding characteristic of the Yorkshire breed. This fact has been borne out in numerous comparisons of the various bacon breeds and Table 7 presents results obtained at this Station:

TABLE 8.—AVERAGE SIZE OF LITTERS OF VARIOUS BREEDS

Dominion Experimental Station, Lacombe, Alta.

—	Tamworth 1925-1935	Berkshire 1924-1932	Yorkshire 1923-1935	Yorkshire 1936-1946	Landrace 1935-1939
Total No. of Litters.....	139	77	388	379	13
Average No. of Pigs Born.....	8.57	9.38	11.98	12.17	10.0
Average No. of Pigs Weaned.....	6.07	6.88	7.76	8.61	5.77

It is interesting to note that for the Yorkshires the number of pigs weaned per litter during the period 1936-1946 is higher than the average for the previous 12 years. Continued selection of the breeding stock and improvements in the nutrition of the pregnant sow and young litters have undoubtedly both contributed.

TWO LITTERS PER YEAR

In the swine industry, as in any business, efficiency is of utmost importance if economy of production is to be attained. This efficiency must apply to the use of investments in housing and breeding stock as well as the operating expenses of labour and feed. The outstanding means of attaining this end is the raising of two litters per sow per year. Perhaps this is best illustrated by examining the feed costs involved in such a program.

Data compiled at Lacombe show that, on the average, approximately one ton of grain is required to carry a sow raising one litter per year through a

to a twelve-month period. For a sow raising two litters per year, approximately 12,300 pounds of grain are required for the same period. Since these figures include feed for the litter until weaning time, they can be presented in a more graphic form.

If the average litter size at weaning is taken as eight, it is obvious that with a sow raising one litter per year 250 pounds of a grain mixture are required to produce each weanling pig, while with a sow raising two litters this is reduced to 144 pounds per pig.

This difference in economy is quite striking. Add to this the more equitable distribution of marketings and the stability assured the swine industry by the production of two litters per year and we have a sound argument in favour of this method.

In breeding for fall litters it is essential that they be farrowed early enough to enable them to withstand winter conditions. In Alberta this means that fall litters should be farrowed not later than September 15. Actually, results at the Lacombe Experimental Station have consistently demonstrated that the strongest, most vigorous litters are those farrowed in early spring and early fall. This suggests breeding sows in November for spring litters and during the last part of May for fall litters. However, this does not mean that winter litters should be avoided. On the contrary, if the breeder provides adequate housing and rations for the sow and young pigs the production of winter litters can be quite successful and will further assist in distributing hog marketings throughout the year.

If such a program is followed, the care and housing of sows producing winter litters become highly important and a pig brooder house such as was built at Lacombe in 1939 will quickly prove its value in providing adequate quarters for winter farrowing. This pig brooder (see cut) is an insulated, hexagonal building which allows for 6 farrowing pens that converge on a brooder stove in the centre of the house. Under normal conditions this building may be cheaply constructed.



Fig. 6.—Pig brooder house built in 1939 which has proven its value for winter farrowing at the Lacombe Station.

Results obtained at this Station in the 10-year period of 1936-46 indicate no significant difference between spring or fall litters in size or vigour. With 30 spring litters and 79 fall litters farrowed during this period, the former average 12.11 pigs farrowed and 8.69 weaned as against the fall litter averages of 12.40 pigs farrowed and 8.30 pigs weaned.

EXPERIMENTAL WORK WITH HOGS

FEEDING EXPERIMENTS

Feeding trials conducted at the Lacombe Station have dealt with various nutritional problems ranging from optimum grain mixtures for feeding to the "hidden hungers" associated with vitamin and mineral deficiencies. The following pages carry reports of results so far obtained. It is important to recognize that such results are not final but may be modified as knowledge of the science of nutrition advances.

Of prime importance to the practical hog producer is the economy associated with the feeding of various rations. This economy will vary in accordance with relative changes in price of the several components of the ration. Because of continuous changes in costs of all feeds and in the price of bacon, an itemization of costs in this report would be of no value. Instead, tables are presented in such a way that costs of production and hence relative economy of gains may be calculated using present-day prices for all items concerned.

In many of the experiments reported here, a basal ration has been fed to all pigs and variations in this ration were made according to the particular experiment involved. Unless otherwise stated, this basal ration consisted of ground oats and ground barley fed in the following proportions:—

From weaning to 110 pounds weight the mixture was 3 parts barley and 2 parts oats. From 110 pounds to market weight the mixture was 4 parts barley and 1 part oats.

GREEN FORAGE FOR MARKET HOGS

During the summers of 1939, 1940 and 1941, experiments were conducted to evaluate the usefulness of green forage in rations for market hogs. Three experimental groups were established. Each received the basic grain ration of oats and barley supplemented with tankage and mineral. Group one, confined to an 8' x 9' pen in the piggery, received the basic ration only. Group two, also confined to the piggery, received the basic ration plus green alfalfa forage carried to the pen daily. Pigs of group three, also receiving the basic ration, had access to a $\frac{1}{3}$ acre paddock seeded down to a mixture of oats and rye.

Results obtained in this experiment are briefly summarized in Table 9.

TABLE 9.—VALUE OF GREEN FORAGE FOR MARKET HOGS

	Fed Inside Piggery		Fed in Outside paddock
	No green forage	green forage	
Number of pigs	16	16	16
Average daily gain.....	1.36	1.44	1.36
Grain per 100 lb gain.....	330.1	307.1	373.8
Tankage per 100 lb. gain.....	24.3	22.5	27.0

From these results it is apparent that pigs confined to indoor pens and supplied with green forage made the highest average daily gains and the most economical gains of the three groups. Feeder pigs allowed freedom of exercise in the pasture had the greatest feed requirements and made the least economical gains.

Carrying green feed regularly to pigs fed inside involves extra labour but the resulting saving in feed costs more than compensates for this additional expense.

PEAMEAL AS A PROTEIN SUPPLEMENT

To obtain information on the feeding value of peameal as a protein source to bacon hogs, a series of 3 experiments was undertaken in 1943-44. Four rations which combined meat scrap and peas in varying amounts with the basal grain mixture were prepared in such a way that the added protein constituted 6 per cent of the ration fed from weaning to 110 lb. weight and 3 per cent thereafter. Two additional rations were also prepared, one containing only one-half this amount of added protein and that entirely as peameal, and the other containing no protein supplement.

A summary of the rations fed and results obtained is presented in Table 10.

TABLE 10.—COMPARISON OF PEAMEAL AND MEATMEAL AS PROTEIN SUPPLEMENT FOR FEEDER PIGS

Group	1	2	3	4	5	6
Protein	Meat scrap	Meat scrap Peameal	Meat scrap Peameal	Peameal	$\frac{1}{2}$ as much Peameal as for Lot 4	No Protein
Number of Hogs Fed.....	14	14	14	14	14	14
Average Daily Gain.....	1.39	1.4	1.36	1.27	1.22	1.13
Grain per 100 lb. Gain.....	278.9	297.9	296.4	307.3	340.7	392.2
Meat scrap per 100 lb. Gain.....	25.8	13.8	7.1	.....	.....	.....
Peameal per 100 lb. Gain.....	.....	29.1	44.4	61.2	31.7	.....

The results in Table 10 show no apparent differences in rate of gain between the first 3 groups but the pigs fed meat scrap alone show a definite superiority in economy of gain, (i.e., the lowest meal consumption per 100 lb. gain). From this it may be concluded that peameal as a protein supplement is less efficient than meatmeal but its use will be determined by the relative price and availability of the two products.

Data from one of the individual experiments comprising this series indicated that toward the end of the feeding period peameal protein may approach the efficiency of meatmeal protein. In other words, older pigs seem to utilize peameal protein more efficiently than young pigs. Detailed study of carcasses produced in this experiment established that the feeding of peameal did not influence carcass quality or fat characteristics.

THE USE OF TANKAGE AS A PROTEIN SUPPLEMENT FOR MARKET HOGS

A series of 3 experiments, designed to study the effect of feeding tankage for varying portions of the feeding period, was carried out in the years 1939 and 1940.

All pigs on the experiment received the basal grain mixture plus 12 per cent of tankage from weaning until they weighed 110 lb. After this weight was obtained, tankage, if fed at all, constituted only 6 per cent of the ration.⁸ However, the age at which tankage feeding was discontinued differed for the various groups. Tankage feeding to group 1 was discontinued at 110 lb. of weight, group 2 at 130 lb., and group 3 at 150 lb., while the pigs in group 4 received tankage until they were marketed at 200 pounds.

Table 11 summarizes the results obtained in the feeding trial. From these results it is apparent that the greatest daily gains were made by those pigs which received tankage throughout the feeding period. It is also shown that on the longer the feeding of tankage is continued the less grain is required to bring the hogs to market weight. The economy of feeding tankage throughout the would depend upon the relative values of tankage and grains.

TABLE 11.—VALUE OF TANKAGE IN THE RATION FOR MARKET HOGS

Feeding of tankage discontinued at average weight of.....	Group 1 110 lb.	Group 2 130 lb.	Group 3 150 lb.	Group 4 200 lb.
Number of pigs.....	21	21	21	21
Average daily gain.....	1.27	1.30	1.31	1.41
Grain required per 100 lb. gain.....	368.91	355.55	355.09	317.07
Tankage required per 100 lb. gain.....	16.13	18.89	21.62	28.55

A second series of feeding tests with tankage was conducted to determine the amounts of this protein supplement required with a barley-oats ration to produce the most economical gains with market hogs. To the basal ration of oats and barley, tankage was added in varying amounts as follows:—

- Group 1. Tankage at 10 per cent from weaning to 110 pounds; 5 per cent tankage thereafter.
- Group 2. Tankage at 8 per cent from weaning to 110 pounds; 4 per cent tankage thereafter.
- Group 3. Tankage at 4 per cent from weaning to 110 pounds; 2 per cent tankage thereafter.
- Group 4. No tankage during either period.

Table 12 summarizes the results obtained in four repetitions of this experiment:

TABLE 12.—PROTEIN LEVEL REQUIRED DURING THE FEEDING PERIOD WITH A BARLEY-OATS RATION

Experimental Group	Group 1	Group 2	Group 3	Group 4
Rates at which tankage fed	Tankage at 10% and 5%	Tankage at 8% and 4%	Tankage at 4% and 2%	No tankage
Number of pigs.....	24	24	24	24
Average daily gain.....	1.37	1.33	1.26	1.06
Grain per 100 lb. gain.....	334.29	341.09	379.13	419.26
Tankage per 100 lb. gain.....	24.46	19.71	10.76	0

The results shown in Table 12 demonstrate only a small difference in the performance of pigs fed tankage at 10 and 5 per cent and those fed tankage at 8 and 4 per cent. However, when lower levels of tankage are included in the grain mixture the feed requirements rise sharply and the daily gain decreases.

VALUE OF MILLING WHEAT FOR HOG PRODUCTION

No. 1 wheat, properly supplemented with tankage, ground limestone and pilchard oil, was fed alone and in combination with oats to determine its value for growing and fattening market hogs. In two trials which included 15 pigs on each of 4 different rations wheat promoted satisfactory and economical gains.

The addition of oat chop in excess of 33 per cent of the meal ration reduced the rate of gain and the economy of gains.

MINERAL SUPPLEMENTS FOR BACON HOGS

Various tests demonstrated that a barley-oats ration adequately supplemented with tankage does not require additional mineral supplementation to promote rapid and economical gains with feeder pigs. Tankage apparently carries sufficient minerals to ensure efficient use of the ration.

Similarly, the feeding of a commercial hog supplement containing bonemeal, alfalfa meal, calcium carbonate, etc., in addition to meatmeal or tankage to pigs well over the critical weaning stage was shown to be less profitable than the feeding of straight tankage. True, such a supplement gave slightly greater efficiency of gains but its higher cost as compared with tankage increased the cost per 100 pounds gain and decreased the net profit per pig.

BREEDING EXPERIMENTS

In the early years of swine work at this Station three breeds of bacon hogs were kept—Yorkshire, Tamworth and Berkshire. A limited demand for breeding stock and the proved superiority in bacon type and prolificacy of the strain of Yorkshire at this Station led to the discarding of the Tamworth and Berkshire breeds by the year 1935.

LANDRACE SWINE

In October, 1935, a shipment of imported Swedish Landrace swine arrived at this Station. This was part of a co-operative project between the various Dominion Experimental Stations to test the Landrace under Canadian conditions and compare the relative merits of the Landrace and Yorkshire breeds.

After five years of testing and crossbreeding work, the Landrace swine and all their progeny were discarded. The strain procured had proved disappointing in prolificacy—the Landrace in 13 litters averaged 10 pigs farrowed and 5.77 weaned as against 11.98 farrowed and 7.76 weaned for the Yorkshire, and were no better than Canadian Yorkshires in economy of production and carcass quality.

PREPOTENCY

In 1942 a breeding program was initiated at the Lacombe Station to locate within the Yorkshire breed strains that demonstrated outstanding production and superior bacon qualities. Foundation stock, selected on the basis of Advanced Registry tests, were progeny tested and, where such progeny tests proved favourable, they were inbred to establish prepotent lines of desirable bacon type hogs.

Qualifications in these progeny tests were high. Ability to raise large, vigorous litters, free from any of the breed disqualifications (swirls, black spots, etc.) and all defects such as ruptures, ridglings or hermaphrodites was essential

and satisfactory feeding ability and carcass tests as gauged by A.R. standards were imperative. Since the progeny test involved inbreeding (sire on daughter), it was obvious that any weakness present in the stock would be quickly uncovered.

The project commenced with the selection of 3 boars, each of which was test mated to 6 of their daughters. Litters produced were disappointing either in size, vigour or freedom from deformities and all of this foundation stock was discarded. However, similar investigations were under way at several other Dominion Experimental Stations and by 1945 inbred lines had been produced that demonstrated outstanding performance. Boars from three of these lines were brought to Lacombe in 1946 and bred to unrelated Lacombe gilts to determine their prepotency in outercrosses.

Concurrent with this breeding project was another designed to study the inheritance of the various carcass characteristics scored in Advanced Registry. There were two experiments involved in this project. In one, boars and gilts were selected from high testing litters (carcass scores over 80) and from low testing litters (carcass scores under 70) and the matings made in such a way that carcass data could be obtained from high-high, high-low, low-high and low-low matings. The boars were unrelated to the gilts to avoid inbreeding.

In the second experiment known as the "Complementation" test, boars from litters scoring high in one particular feature such as length or back fat measurements were mated to gilts from litters that scored low in the same character.

This test will not be complete until 1949 at which time analysis of the data should provide valuable information on the genetical practicability of Advanced Registry.

RHINITIS

Contrary to general opinion rhinitis, or "bull nose" as it is sometimes called, is not a new disease to the West. Its increased prominence in recent years has probably stemmed, in part, from the great intensification of swine production throughout this region.

In 1945, about 50 per cent of the spring farrowed pigs at the Lacombe Station developed the distorted twisted snout and sneezing symptoms of rhinitis. This, the first appearance of the disease here, was associated with a very dusty condition of the straw litter which undoubtedly contributed to the severity of the outbreak. Little is known about rhinitis and some divergence of opinion exists regarding its cause and transmission. However, intensive research on the problem is progressing and at the present time this station is co-operating with the Dominion Veterinary Research Laboratory at Lethbridge, Alta., and at Hull, Que., in a study of the various factors that may have a bearing on the disease.

An important observation that seems justified from experience with the disease at this Station is that the economic loss from rhinitis is not necessarily serious when affected pigs are fed a well balanced ration. In 1945, data were obtained from feeding 120 pigs, of which 59 demonstrated symptoms associated with rhinitis. The meal mixture consisted of 3 parts barley, 5 parts oats and 2 parts wheat for the growing period, and 3 parts barley, 1 part oats and 1 part wheat for finishing. It is important to note that the ration was fed as a slop mixture. On this feed the affected pigs averaged gains of 1.13 pounds daily as compared with gains of 1.24 pounds daily for the non-affected pigs. This resulted in only a 10-day difference in the average market age of the two groups.

CEREALS

A. D. McFadden

The cereal division is responsible for all variety testing work with wheat, oats, barley, flax, peas and winter cereals. In addition to the above, considerable selection work with wheat, oats and barley was carried on during the ten-year period from 1937 to 1946. Co-operative projects including the Crop Testing Plan and the Canadian Seed Growers Association Verification Test were carried every year with a number of special co-operative projects with other divisions and institutions carried as the occasion warranted. Foundation stock seed of a limited number of oat and barley varieties were processed and maintained.

Activities within the division may be broken down under a number of sub-headings each dealing with a specific phase of the work. These are listed and reviewed briefly in the following paragraphs.

NATIONAL TESTING WORK

Due to the number of institutions engaged in breeding and selection work with all classes of cereals, it became imperative that nationally organized tests should be designed to offer institutions a medium for testing their most promising selections. Also many new varieties were introduced from other countries requiring extensive testing to evaluate their particular merits. In 1934 the Cereal Division, Central Experimental Farm, Ottawa, instituted national testing for new and promising selections. Uniform tests were organized and designed, to be carried on at branch Farms and Stations throughout Western Canada. The Lacombe Station is one of the co-operating institutions and, from 1934 to 1946, three national wheat tests, two national oat tests, one national barley test and one national flax test were initiated. All of the above tests carry a limited number of standard varieties as checks with which to compare new selections submitted by the institutions engaged in breeding and selection work. With such an organization, it is possible to determine adaptability and performance over a wide range of soil and climatic conditions, in a minimum number of years.

TESTING OF STANDARD AND PROVEN VARIETIES

Any new selections that show sufficient merit to warrant their being licensed must be tested further over the area served by individual Stations, in order to determine local adaptability. During the decade which this report covers, many new varieties became licensed and were distributed to farmers in central Alberta. The local performance of such varieties was determined by setting up standard tests of wheat, oats, barley, flax and peas that included a number of recommended varieties plus any new selections that showed promise in the national tests. These tests, which were carefully planned comparative trials, were located at Lacombe, and through the co-operation of the Division of Illustration Stations, it was possible to have the same tests conducted at strategic locations throughout the area served by the Station. Thus, it has been possible to determine, in a short period of time, the relative performance of all new varieties with respect to their local adaptability. A number of such varieties will be discussed individually in the following pages.

PLANT BREEDING AND SELECTION WORK

The Cereal Division, Central Experimental Farm, Ottawa, Ont., has supplied Lacombe with bulked populations of suitable crosses. During the war years, selection work was curtailed to the bare minimum because of a lack of personnel.

However, during the ten-year period under review Eagle oats and Sanalt barley proved sufficiently promising to warrant their introduction, and initial distributions were made in 1937 and 1939, respectively. In 1946, the initial distribution of Larain oats took place. Larain is a selection from a Gold Rain-Alaska cross which is proving particularly promising in the foothill area of central Alberta where early maturity is essential. Commencing in the spring of 1946, an extensive barley breeding program was started.



Fig. 7.—Head rows, rod rows, and increase blocks used in processing foundation seed and in increasing Certified seed of new varieties at the Dominion Experimental Station, Lacombe.



Fig. 8.—The Experimental Station, Lacombe, maintains foundation stock seed blocks of varieties of grain being introduced for use in Central Alberta.

CO-OPERATIVE PROJECTS

THE CROP TESTING PLAN

The Crop Testing Plan was started in 1930 through the efforts of the research department of the Searle Grain and affiliated companies. The Dominion Department of Agriculture has co-operated in this project and since its inception the Dominion Experimental Station at Lacombe, has grown and analysed approximately 500 samples each year. Essentially, the plan calls for collecting samples of commercial wheat delivered to elevators, with a view to determining purity of variety. It was felt that such a service, when carried on for a period of years, would encourage the use of pure seed, which in turn would be reflected by a general improvement of quality in the wheat offered for sale.

The samples grown at Lacombe represent only a small percentage of the samples grown by the Dominion Crop Testing Plan. Each year a complete report on the above plan is published, hence, it is sufficient to report that so far as Lacombe samples are concerned a marked improvement has been recorded in their purity. Further, in the early years many unsuitable varieties such as Red Fife, Early Triumph, Sask. 7, Early Red Fife and others represented a fair percentage of the wheat being produced, but by 1946, varieties not recommended for production were reduced to a trace.

THE C.S.G.A. VERIFICATION TESTS

For many years this Station has co-operated with the Canadian Seed Growers Association by growing samples of the "Elite Stock Seed" and "Foundation Stock Seed" produced in Alberta. As a final check on the purity of these high grades of seed, the samples are checked carefully for any off-types. A complete report on the purity of all samples is submitted yearly to the office of the Secretary, Canadian Seed Growers Association. In 1936, Marquis, Reward, Garnet, Reliance and Ceres wheat were grown in the tests as compared with Canus, Garnet, Marquis, Red Bobs, Regent, and Thatcher in 1946. Regarding oats, Victory, Banner, Abundance, Alaska, Legacy and Gopher were grown in 1936 as compared with Ajax, Banner, Eagle, Exeter, Legacy, Vanguard and Victory in 1946. Regarding barley, O.A.C. 21, Trebi, Regal, Colsess, Hannchen and Charlottetown 80 were included in 1936 as compared with Newal, O.A.C. 21, Olli, Sanalta, Titan and Trebi in 1946. Since pure seed stocks are indicative of the varieties being grown for commercial markets it can be seen that a marked change in varieties occurred during the decade.

TABLE 13.—DATA COMPILED ON RATES OF SEEDING
REWARD WHEAT—4-YEAR AVERAGE, 1935-1938 INCLUSIVE

Rate of seeding per acre	Days to mature	Height in inches	Strength of straw	Yield in bushels per acre
			Scale 1 weak 10 strong	
½ bushel.....	102.5	38.25	10.00	29.35
1 bushel.....	102.0	38.25	10.00	33.90
1½ bushels.....	101.0	38.25	9.75	36.82
2 bushels.....	100.75	38.25	9.50	36.25
2½ bushels.....	99.75	36.75	8.75	33.65
3 bushels.....	99.75	37.00	8.25	33.25

TABLE 14.—DATA COMPILED ON RATES OF SEEDING LEGACY OATS
4-YEAR AVERAGE, 1935-1938 INCLUSIVE

Rate of seeding per acre	Days to mature	Height in inches	Strength of straw	Yield in bushels per acre
			Scale 1 weak 10 strong	
½ bushel.....	101.50	43.00	9.75	83.5
1 bushel.....	101.25	42.75	9.50	98.9
2 bushels.....	100.00	41.25	9.25	103.5
3 bushels.....	99.25	40.25	8.50	98.6
4 bushels.....	98.50	38.50	8.25	94.3
5 bushels.....	98.50	38.25	8.25	91.8

SPECIAL PROJECTS

In 1935, a rates-of-seeding project was started with a view to determining the most suitable rates of seeding for wheat, oats and barley. Reward wheat, Legacy and Victory oats and Trebi barley were used in this project.

With wheat and barley, $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, and 3 bushel rates per acre were tested; with oats, $\frac{1}{2}$, 1, 2, 3, 4, and 5 bushel rates per acre. The project was carried on for four consecutive years. Data presented in the accompanying tables include days to mature, length and strength of straw, and yield in bushels per acre.

A few general observations can be made which apply to all cereal crops. First, it is apparent that as the rate of seeding increases the number of days required for the crop to reach full maturity decreases. In all cases, the difference in maturity between the lightest rate of seeding and the heaviest rate averaged about 3 days. In general, it will be noted that the heavier rates tend to produce a crop which is slightly shorter. Although the data presented do not emphasize reduction in straw strength by heavier rates of seeding, this showed up most markedly in 1938 when conditions were favourable for lodging. In 1935, 1936 and 1937 no serious lodging occurred and plots for all rates

TABLE 15.—DATA COMPILED ON RATES OF SEEDING VICTORY OATS
4-YEAR AVERAGE, 1935-1938 INCLUSIVE

Rate of seeding per acre	Days to mature	Height in inches	Strength of straw	Yield in bushels per acre
			Scale 1 weak 10 strong	
½ bushel.....	106.50	46.75	9.75	75.9
1 bushel.....	105.75	45.25	9.50	82.3
2 bushels.....	104.75	44.50	9.00	87.4
3 bushels.....	104.25	43.75	8.25	92.6
4 bushels.....	103.50	42.50	8.00	91.0
5 bushels.....	103.25	40.75	7.75	88.2

TABLE 16.—DATA COMPILED ON RATES OF SEEDING TREBI BARLEY
4-YEAR AVERAGE, 1935-1938 INCLUSIVE

Rate of seeding per acre	Days to mature	Height in inches	Strength of straw	Yield in bushels per acre
			Scale 1 weak 10 strong	
½ bushel.....	101.25	30.00	8.00	56.7
1 bushel.....	101.00	29.75	8.00	62.8
1½ bushels.....	100.75	29.25	7.75	55.5
2 bushels.....	99.00	29.00	7.50	62.5
2½ bushels.....	98.50	28.75	7.50	64.3
3 bushels.....	98.50	28.25	7.50	63.0

remained standing throughout the growing season. In 1938, however, straw strength was of primary importance and the heavier rates of seeding showed serious lodging while the lighter rates were much more satisfactory.

An analysis of the data compiled on yield reveals that generally little advantage can be gained through heavy rates of seeding. It will be noted that in wheat there was a progressive increase in yield up to 1½ bushels per acre with a slight reduction in yield as the rates were increased beyond the 1½ bushels. In oats the optimum rate appeared to fall somewhere between the two and three bushel rate. In barley it is difficult to explain the low average figure for the 1½ bushel rate of seeding. However, it would appear that little increase in yield can be anticipated through increasing the rate beyond 1½ bushels since 1 bushel gave an average yield of 62.8 compared with an average of 63.3 for the 2, 2½, and 3 bushel rates.

The above test was carried on with some varieties that have been removed from the list of recommended varieties. In view of this situation, plans are being made to design a similar test using present day varieties.

SPRING WHEAT

In view of the foregoing organization for the testing of cereal varieties some accurate information regarding the relative performance of a number of wheat varieties has been accumulated. The following tables present data compiled on those varieties of special interest to the readers of this report. Since it is impossible to present full ten-year data on all varieties, appropriate averages have been worked out in order to give comparisons of newer introductions with the standard varieties. Data presented include maturity, length and strength of straw, yield in bushels per acre and weight per 1,000 kernels.

It will be noted in Table 17 that Thatcher has been used as a variety to compare with the new introductions. From the ten-year average, Thatcher is only slightly later maturing than Red Bobs and it outyielded Red Bobs by a slight margin. For this reason, new varieties can appropriately be compared with Thatcher.

Marquis may be thought of as a standard milling and baking variety. For Central Alberta it is relatively late maturing and because of this fact cannot be expected to produce exceptionally high yields. In two out of five years, experimental evidence indicates that yield and quality of Marquis are severely affected by early fall frosts. Marquis is susceptible to the rusts and smuts.

TABLE 17.—DATA COMPILED ON VARIETY TESTS WITH WHEAT

Variety	Days to mature	Height in inches	Strength of straw	Yield in bushels per acre	Weight in grams per 1000 kernels
			Scale 1 weak 10 strong		
10-year average, 1937-1946 inclusive					
Marquis.....	127.4	48.2	7.1	55.0	35.9
Red Bobs.....	121.6	47.1	6.7	60.7	37.3
Thatcher.....	123.2	44.4	8.1	61.8	35.4
3-Year Average, 1944-1946 inclusive					
Saunders.....	121.7	42.2	8.6	56.0	31.6
Redman.....	123.0	45.0	8.4	58.5	35.3
Regent.....	125.4	45.4	8.0	59.3	33.1
Thatcher.....	127.2	45.8	6.7	60.0	32.1

At Lacombe, a ten-year average shows Red Bobs as being about six days earlier than Marquis. This difference is sufficient to materially lessen the hazard from early fall frosts to assure satisfactory yields with Red Bobs when grown in the western regions of central Alberta. It does, however, tend to produce a piebald kernel when grown on the clay soils. It also lacks somewhat in straw strength and shatters readily if let stand till it is dead ripe. Red Bobs is susceptible to rusts and smuts.

Thatcher has continued to gain in popularity and by the summer of 1946 had displaced considerable acreage previously devoted to the production of Marquis, Red Bobs and Garnet.

A review of the ten-year data reveals that Thatcher is slightly later maturing than Red Bobs, slightly shorter but considerably stronger in straw, and holds a slight edge in yielding ability. It has proved difficult to thresh, hence does not shatter readily. It has a smaller kernel which tends to bleach readily although this latter characteristic has little or no deleterious effect on grade. A survey of elevator agents in central Alberta reveals that Thatcher can be expected to average about one-half grade higher than Red Bobs. Thatcher is highly resistant to stem rust and loose smut but is susceptible to leaf rust and bunt or stinking smut.

Regent is a selection from a H 44 \times Reward cross made in 1926 by the Dominion Laboratory of Cereal Breeding, Winnipeg, Man. It was first distributed in 1939. It matures about two days earlier than Thatcher and, on the heavy black soils of central Alberta, it compares favourably with Thatcher in yield. For the entire area of central Alberta, experimental data reveal that Regent will give an average yield somewhat lower than Thatcher. It produces a crop slightly longer strawed and somewhat stronger strawed than Thatcher, on the average. It resembles Thatcher in that it is difficult to thresh, hence is a good combine wheat. Regent is resistant to stem rust and bunt or stinking smut and moderately resistant to leaf rust and loose smut.

Redman is a selection from a Regent \times Canus cross made in 1934 by the Dominion Laboratory of Cereal Breeding at Winnipeg. Initial distribution was made in 1947. Redman showed greater resistance to leaf rust than Thatcher,

hence was introduced with the thought that it would prove superior in those areas where leaf rust can be a serious problem. A review of the 3-year average data reveals it to be quite similar to Regent in length and strength of straw and yield but it appears to have a larger kernel and shows slightly earlier maturity than Regent. It has proved a relatively easy variety to thresh. Redman is resistant to stem rust and bunt or stinking smut and moderately resistant to leaf rust and loose smut.

Saunders is a selection made from a Thatcher \times (Hope \times Reward) cross made in 1938 by the Cereal Division, Central Experimental Farm, Ottawa. As a result of its performance prior to 1947, Saunders was licensed in the spring of 1947. It was introduced with the thought that it would replace considerable acreage at present devoted to the production of Red Bobs and Garnet.

A review of the data reveals that Saunders is considerably earlier than Thatcher, has shorter, stronger straw but possibly can be expected to yield slightly less than Thatcher. However, its earlier maturity should prove especially beneficial for growers in the western and northern regions of central Alberta. Saunders is resistant to stem rust and shows moderate resistance to leaf rust, bunt or stinking smut and loose smut.

WINTER WHEAT

In the early years of operation at the Lacombe Station, winter wheat was proved to be a hazardous crop since most varieties showed a lack of winter hardiness. However, 1933 was the last year when serious winter-killing occurred with the more hardy varieties and experimental data would indicate that profitable returns can be expected in that portion of central Alberta where continuous snow cover gives adequate winter protection.

A ten-year average (1937-1946 inclusive) shows Kharkov, the one recommended variety, to yield 51.6 bushels per acre compared with the 61.8 bushels per acre for Thatcher. However, winter wheat starts growth very early in the spring and offers greater competition to wild oats than spring-seeded wheat. Since the winter wheat is normally ready to harvest about three weeks earlier



Fig. 9.—Farmers take an intense interest in what the speaker is saying at the cereal crop field day, Dominion Experimental Station, Lacombe.

than spring wheat, any wild oats that do persist in the crop are harvested prior to the time when serious shattering occurs. Thus, it is possible to grow winter wheat on land heavily infested with wild oats when spring wheat would prove most unprofitable. Furthermore, the growing of winter wheat on a portion of the cultivated acreage on any farm will ease the rush during seeding and harvesting periods, thus resulting in evener distribution of work throughout the spring, summer and fall months.

OATS

During the 10-year period under review, useful information has been compiled with reference to agronomic performance of a number of oat varieties. The following tables present the results obtained with varieties of special interest to the readers of this report. It will be realized that with the introduction of new varieties from time to time it is impossible to present 10-year average data for all varieties. Appropriate averages have therefore been worked out using Eagle as the check with which to compare newer introductions. Data presented in the tables include maturity, length and strength of straw, yield in bushels per acre and weight per 1000 kernels.

A brief paragraph on the origin and description of the varieties as well as their adaptability is given below.

Victory.—This variety has a Swedish origin and was selected from a European variety called Milton. It was first introduced into Canada in 1911 and its production spread rapidly over the entire Prairie Provinces. A review of the 10-year data reveals that it can be classed as a relatively late-maturing variety. It has exceptionally long straw but shows a decided weakness in strength of straw when grown on the heavy soils of central Alberta. It gives

TABLE 18.—DATA COMPILED ON VARIETY TESTS WITH OATS

Variety	Days to mature	Height in inches	Strength of straw	Yield in bushels	Weight per 1000 kernels
10-Year Average, 1937 to 1946					
Victory.....	117.7	52.5	5.0	122.2	31.4
Eagle.....	114.8	47.8	6.5	126.5	30.4
Legacy.....	108.4	47.5	5.5	124.9	29.4
7-Year Average, 1940 to 1946					
Ajax.....	106.4	48.8	5.1	126.2	29.3
Larain.....	102.0	47.8	7.8	122.3	35.6
Eagle.....	113.5	48.0	5.4	126.0	31.3
3-Year Average, 1944 to 1946					
Beaver.....	111.0	50.0	5.0	118.4	30.9
Eagle.....	118.9	46.0	5.4	128.6	30.1
2-Year Average, 1945 and 1946					
Garry.....	115.0	50.5	6.8	111.9	31.5
Eagle.....	116.9	45.4	5.9	129.1	31.2

good yield and is high in weight per 1000 kernels. In areas where maturity is not the limiting factor of production, Victory has continued to hold its favour when compared with all other varieties.

Eagle.—Eagle is another variety which was introduced from Sweden and is a selection from a Victory \times Von Lochow's Yellow cross. It exhibits superior strength of straw, when grown on the heavy soils of central Alberta, and for this reason initial distribution of this variety was made from the Lacombe Station in 1937. It is slightly earlier than Victory in maturity. It has shorter and stronger straw and compares favourably in yielding ability. Eagle has a slightly smaller kernel than Victory with about 1 per cent less hull. As indicated above, the main reason for growing Eagle in preference to Victory is the fact that it has stronger straw for production on the heavy black soils where rainfall is plentiful.

Legacy.—Legacy was developed from a cross between Banner Ott 49 and 80 Day (Ott 42) made in 1906 by the Cereal Division, Central Experimental Farm, Ottawa. It was introduced into central Alberta because of the need for an earlier maturing variety than Victory. A review of the 10-year data reveals that Legacy will mature in about 9 days less than Victory, is slightly shorter in the straw and has about the same strength of straw as Victory. The yield data indicate that Legacy will yield particularly well in view of its maturity. It produces a rather slim, unattractive kernel but has a low percentage of hull and livestock feeders have commended Legacy very highly for the quality of chop it produces.

Ajax.—This variety is the result of a cross between Victory and Hajira made by the Dominion Laboratory of Cereal Breeding and its initial distribution took place in 1941. It was introduced because it carried moderate resistance to stem rust and on the whole showed excellent adaptability over the Prairie Provinces. In maturity it ranks about 7 days earlier than Eagle and in other respects it compares favourably with Eagle. It resembles Legacy in kernel type and, like Legacy, it has been commended by livestock feeders.

Larain.—This variety is a result of the cross between Gold Rain and Alaska made by the Cereal Division, Central Experimental Farm, Ottawa, in 1927. The final selection was made in 1939 by the Dominion Experimental Station, Lacombe, and an initial distribution took place in the spring of 1946. It will be noted that Larain has very early maturity, good length and strength of straw, and exceptionally good yielding ability in relation to its maturity. It produces a very attractive sample of threshed grain with plump kernels and a low percentage of hull. It does, however, tend to shatter some and farmers have found it difficult to thresh without hulling a considerable percentage of the kernels.

Larain was introduced with the thought that it would prove advantageous in the western and northern portions of central Alberta. In these regions early maturity is very important and the later maturing varieties very frequently suffer severe damage from early fall frosts. Experimental evidence reveals that Larain should be confined to production in areas mentioned above since it does not produce satisfactory yields in the drier regions of the southern and eastern portions of central Alberta.

Beaver.—This variety was developed at the Central Experimental Farm, Ottawa, from an Erban \times Vanguard cross. It was first distributed in 1945 because it carried resistance to crown rust and moderate resistance to stem rust. Under central Alberta conditions, it can be classed as a medium-maturing variety and compares favourably with Eagle in all respects except from the standpoint of yield. It is doubtful if this variety will become widespread in central Alberta.

Garry.—*Garry* was developed by the Dominion Laboratory of Cereal Breeding, Winnipeg, from a cross between *Victory* and (*Victoria* × [Banner × *Hajira*]). It was licensed in the spring of 1947 since it carried resistance to prevailing races of crown and stem rust and was resistant to all smuts. *Garry* was under test for only two years at Lacombe. However, on the basis of this data it may be classed as a variety of medium-late maturity, with long, fairly strong straw but lacking somewhat in yielding ability in relation to its maturity. In recent years, *Garry* has shown extreme susceptibility to *Victoria* blight and there is little reason why it should be considered for production in central Alberta.

BARLEY

In recent years a number of new varieties of barley have been introduced. The following tables present data compiled on those varieties of special interest to readers of this report. As was the case in wheat and oats, it is impossible to present 10-year data on newer introductions. For this reason appropriate averages are presented using *Newal* as the variety with which to compare the newer introductions. Data is presented on maturity, length and strength of straw, yield in bushels per acre and weight per 1000 kernels.

TABLE 19.—DATA COMPILED ON VARIETY TESTS WITH BARLEY

Variety	Days to mature	Height in inches	Strength of straw	Yield in bushels	Weight per 1000 kernels
10-Year Average, 1937-1946 inclusive					
O.A.C. 21.....	103.9	47.0	3.8	61.4	38.2
Olli.....	94.6	40.1	5.5	59.1	35.2
Newal.....	101.6	45.6	4.8	74.2	41.0
Sanalta.....	107.6	47.7	4.7	71.3	44.8
Titan.....	98.5	42.4	6.9	64.1	42.2
3-Year Average, 1944 to 1946					
Montcalm.....	110.5	48.6	2.8	45.7	41.2
Newal.....	107.6	48.2	3.5	66.6	39.3
2-Year Average, 1944 and 1945					
Warrior.....	99.8	41.8	7.7	71.6	35.8
Newal.....	105.5	48.8	3.5	71.9	38.2

A brief paragraph on the origin and description of the varieties as well as their adaptability in each case is given below.

O.A.C. 21.—This variety was selected by the Ontario Agricultural College and was first distributed in 1910. It is a rough-awned, 6-rowed variety, eligible for the top grades. A review of the 10-year data reveals that it may be classed as a relatively late-maturing variety, having long, comparatively weak straw, and in relation to some of the feed barleys can be classed as a medium-yielding variety. A characteristic common to *O.A.C. 21* is the fact that prior to full maturity a fair percentage of the heads break off, thus losses from this source

do reach serious proportions in some years. O.A.C. 21 is the standard for malting quality in Canada and because of this fact considerable acreage in central Alberta is still devoted to production of this variety.

Olli.—This variety is a selection from a hybrid introduced from Finland. It is a rough-awned, 6-rowed variety, eligible for the top grades. *Olli* is the earliest maturing barley variety in general production at the present time, has relatively short straw of medium strength and produces satisfactory yields in relation to its maturity. Possibly no other variety has done more for barley performance in the western and northern portions of central Alberta than has *Olli*. Its early maturity renders it suitable for production on land that is heavily infested with wild oats since it germinates rapidly and is normally harvested before any serious shattering of wild oats occurs. Over a period of years, therefore, it is possible to materially reduce wild oat infestations in the heavy, black soils of central Alberta by growing *Olli* continuously.

Newal.—*Newal* is the result of a Manchuria \times (Lion \times O.A.C. 21) cross made in 1919 by the University of Alberta. It was first distributed in 1935. It is a smooth-awned, 6-rowed variety that is eligible for No. 2 CW Yellow. A review of the data reveals it to be slightly earlier than O.A.C. 21, slightly stronger in the straw and superior in yielding ability. *Newal* is, however, quite susceptible to loose smut although this factor has not seriously reduced its yielding ability in areas where moisture is fairly plentiful. Livestock feeders commend *Newal* very highly and, in spite of its susceptibility to loose smut, it can be considered one of the excellent feed barleys for production in areas where maturity is not essential.

Sanalta.—*Sanalta* is a selection from a smooth-awned \times Duckbill type made by the University of Alberta in 1919. Initial distribution took place from the Lacombe Station in 1939. *Sanalta* is a smooth-awned, 2-rowed type which is eligible for grade No. 1 feed. It is a late-maturing variety with good length and fair strength of straw and high yielding ability. A sample of threshed grain when this variety reaches full maturity has excellent quality and is commended very highly by livestock feeders. Because of its late maturity it can be considered a main crop variety for production in central Alberta.

Titan.—*Titan* is the selection from a Trebi \times Glabron cross made by the University of Alberta. Initial distribution took place in 1943. It is a smooth-awned, 6-rowed type eligible for grade No. 1 feed. *Titan* is a relatively early-maturity variety with fair length and good strength of straw and good yielding ability. The one objection so far as central Alberta is concerned is the fact that the awns are very persistent and if weather conditions are not ideal at the time of harvesting a sample of threshed grain will contain a high percentage of awn. This is a serious objection from the standpoint of feed barley because the fibre content is relatively high, and from a seed standpoint it presents difficulties at time of seeding. This one factor has probably curtailed the production of *Titan* in central Alberta.

Montcalm.—*Montcalm* is the result of a selection from a (Michigan \times Common 6-rowed) \times Mandscheuri, made in 1919 at Macdonald College, Quebec. Initial distribution was made in 1946. It is a smooth-awned, 6-rowed type, eligible for the top grades. Since it was only under test for three years at Lacombe, conclusive evidence regarding its performance is difficult to present at the present time. In all agronomic characters *Montcalm* ranks with O.A.C. 21. Experimental evidence would indicate that this variety may serve a useful purpose in areas where early maturity and extreme strength of straw are not limiting factors of production.

Warrior.—Warrior is the result of a selection from a Trebi \times Colsess cross made in 1930 by the University of Saskatchewan. It was first distributed in 1943. It is a hooded, 6-row type eligible for grade No. 1 feed. Although the data presented cover only a two-year period, it would appear that this variety shows considerable promise for production on the heavy, black soils of central Alberta. In maturity it averages about 4 days later than Olli, has medium length of straw, is superior in strength of straw, and produces excellent yields in relation to its maturity. Since Warrior is a hooded type, a fair percentage of the hoods still remain in the threshed sample. This results in an increase in the fibre content, yet any livestock feeders who have had experience with this variety commend it highly as a feed barley.

FLAX

The accompanying table presents 10-year-average data on Bison, Redwing and Royal flax. Flax production in central Alberta has been periodic with many farmers for the reason that it is a crop that will not readily compete with many weeds and one that is susceptible to late spring and early fall frosts. However, as indicated by the data presented in the following table, satisfactory

TABLE 20.—DATA COMPILED ON VARIETY TESTS WITH FLAX
10-YEAR AVERAGE, 1937 to 1946 INCLUSIVE

Variety	Days to mature	Height in inches	Strength of straw	Yield in bushels	Weight per 1000 kernels
Bison.....	118.5	28.3	8.3	25.6	6.5
Redwing.....	113.8	28.2	9.4	28.0	5.9
Royal.....	121.0	28.8	7.7	23.7	6.3

yields of flax can be expected provided early-maturing varieties are grown. A brief paragraph on origin and description of each variety, as well as their adaptability, is given below.

Bison.—This variety is a selection from commercial stock seed from Belgium made by the North Dakota Agricultural Experimental Station, Fargo, North Dakota, in 1912. It was first distributed in Canada in 1925. Bison normally carries high oil content with low iodine value. It is resistant to wilt but very susceptible to rust with moderate resistance to pasmo. It will be noted from the data that its average maturity is about 5 days later than Redwing and that the 10-year average shows its yield to be less than Redwing. The lower yields recorded in the later maturity varieties can be best explained by the fact that frequently these varieties are damaged by early fall frosts when the earlier varieties like Redwing normally reach full maturity without severe damage. In other words, Bison can be considered as being too late maturing for production in the western and northern portions of central Alberta. It is, however, considered suitable for production on the black soil zones in the southern and eastern portions of the area.

Redwing.—This variety is the selection made by the Minnesota Agricultural Experimental Station and was first distributed in Canada in 1924. It gives medium oil yield with high iodine value. It is normally resistant to wilt and pasmo and moderately susceptible to flax rust. A review of the 10-year-average data reveals that it is a relatively early-maturing variety, has good length and strength of straw and can be depended upon to produce satisfactory yields. Redwing has been the only recommended variety for production in the western

and northern regions of central Alberta primarily because of its maturity.

Royal.—Royal is a selection from Crown made by the University of Saskatchewan and initial distribution took place in 1938. It gives a high oil yield with a low iodine value. It has moderate resistance to wilt and rust but is moderately susceptible to pasmo. It is later maturing than Bison, hence its yielding ability at Lacombe is somewhat reduced. An additional disadvantage of Royal for production in central Alberta is the fact that it continues to produce green shoots which renders it unsatisfactory and troublesome at harvest time. Like Bison, it is definitely too late maturing for production in western and northern regions of central Alberta.



FIG. 10—Stooked grain, Lacombe, Alta.

In recent years a number of new flax varieties have been licensed for production in Canada. For the most part, all these newer introductions are in the same maturity class as Bison and Royal and for this reason cannot be considered suitable for production in central Alberta. However, the Lacombe Station is carrying on extensive tests with all of these newer introductions and should a competitor for Redwing be found this Station will make every effort to publicize the fact.

FIELD HUSBANDRY

H. W. Leggett

The work in this division includes projects dealing with crop rotations, cost of producing various crops, comparisons of cultural and cropping methods for farm crops, manure and commercial fertilizer trials and weed control.

CROP ROTATIONS

One of the main functions of the Station is the study of crop rotations. Three of these rotations have been conducted on a field scale since 1911. Accurate records of the cost of production and the returns from each crop have been kept in order to make a comparison of the net returns between the one straight grain rotation and the two mixed-farming rotations. The other rotations have been conducted on smaller areas in order to get comparable yield data on different three- and four-year rotations.

The black soil zone of central and northern Alberta is ideally suited to mixed farming and crop rotations are the answer in any diversified agricultural program. Good crop rotations provide for systematic cropping of the land in a way that maintains or improves soil fertility, yields, fibre and organic matter and controls weeds.

The mixed farming rotations have shown an outstanding advantage over the grain rotation especially in the last ten-year period. Comparisons of the crop yields of these three main rotations show over a period of thirty-five years that the wheat after fallow or intertilled crop on the mixed-farming rotations outyields the wheat after fallow on the straight grain rotation by eight to ten bushels per acre. The picture in the last ten-year period (1937-46) shows that wheat in the mixed-farming rotations yielded almost double that of the wheat in the straight grain rotation. This is due, in part, to the addition of a grass and legume crop, an application of fifteen tons of barnyard manure, and fewer weeds, particularly wild oats, in the mixed-farming rotations.

Comparing the net returns of the three rotations, it is found that the cash grain crops grown on the mixed-farming rotations are more profitable than on the straight grain rotation. The chief reasons for this are higher yields and the better use of labour and machinery required.

Tables 21, 22 and 23 show the average yields which have been obtained and the average profit per acre for the period 1912-46 and the last ten-year period 1937-46.

Straight grain rotations in the black soils of Alberta have a tendency to become polluted with weeds, particularly wild oats. An attempt has been made in the last few years to control these, on the straight grain rotations, by surface

TABLE 21.—AVERAGE YIELDS AND PROFITS PER ACRE—3-YEAR GRAIN ROTATION

Three-year grain rotation "C"	No. of years*	Average yield per acre		Profit per acre	
		1913-46	10-year period 1937-46	1913-46	10-year period 1937-46
1st year—summerfallow.....		bu.	bu.	\$	\$
2nd year—wheat.....	34	25.1	21.7	8.58	4.33
3rd year—wheat.....	34	15.9	14.6	4.00	1.19

*34 years only.

TABLE 22.—AVERAGE YIELDS AND PROFITS PER ACRE—
7-YEAR MIXED FARMING ROTATION

Seven-year mixed-farming rotation "O"	Average yield per acre		Profit per acre	
	1912-46	10 year period 1937-46	1912-46	10 year period 1937-46
1st year—potatoes.....	tons	7.58	10.10	96.29
2nd year—wheat.....	bu.	35.90	42.70	18.05
3rd year—oats.....	bu.	64.50	87.40	11.35
4th year—fallow.....				
5th year—wheat.....	bu.	33.30	40.00	9.44
6th year—hay.....	tons	1.72	1.84	3.53
7th year—hay.....	tons	1.39	1.51	2.48
			\$	\$

tillage and deferred seeding, but little has been accomplished. This is due to two main reasons: Early ripening and ready shattering, and dormancy of seeds. In a straight grain rotation, these two factors are extremely hard to deal with and result in reduced yields and high dockage. On the mixed-farming rotations, located immediately adjoining the straight grain rotation, there is little or no wild oats which proves that this weed can be controlled much more easily by a mixed-farming rotation.

While it is improbable that either potatoes or corn could be used extensively in any mixed-farming rotation on the black soils, the results show that the wheat yields after potatoes or corn are equally as good as those after summerfallow. Summerfallow or other intertilled crops can always be used in place of potatoes or corn. Hay yields have been fairly good on these rotations but not in proportion to those of the grain yields. The hay would, however, show a much larger profit per acre if marketed through livestock instead of being sold on the open market.

The laying out of a crop rotation is an individual problem for each farm and depends on the type of farming to be followed. A crop rotation should be one which helps to control weeds, maintains soil fertility, distributes labour more evenly, provides feed for livestock and gives a profitable cash return.

THREE-YEAR ROTATIONS

The object of this study is to secure comparable data in a number of different three-year rotations. Both diversified and straight grain rotations are compared.

TABLE 23.—AVERAGE YIELDS AND PROFITS PER ACRE—
6-YEAR MIXED FARMING ROTATION.

Six-year mixed farming rotation "K"	Average yield per acre		Profit per acre	
	1912-46	10-year period 1937-46	1912-46	10-year period 1937-46
1st year—corn.....	tons	9.91	12.30	3.84
2nd year—wheat.....	bu.	34.30	44.00	14.93
3rd year—barley.....	bu.	39.60	53.70	5.85
4th year—hay.....	tons	1.31	1.31	2.86
5th year—hay.....	tons	1.43	2.26	8.53
6th year—hay.....	tons	1.18	1.82	3.58
			\$	\$

When the net energy or total digestible nutrients of the threshed grain of the different grain crops is calculated, there appears to be little difference in the productivity of the different crops in the different rotations. The main difference between the various rotations is the problem of weed control.

The three-year rotations and the average yields for seven years are listed in Table 24:—

TABLE 24.—THREE-YEAR ROTATIONS—7-YEAR AVERAGE YIELDS

Rotation	Year 1		Year 2		Year 3	
	Crop	Yield	Crop	Yield	Crop	Yield
1.	Summerfallow.....		Wheat.....	43·0	Wheat.....	38·5
2.	Summerfallow.....		Wheat.....	42·8	Oats.....	96·9
3.	Summerfallow.....		Wheat.....	47·0	Barley.....	55·5
4.	Corn.....tons	7·02	Wheat.....	36·6	Wheat.....	35·0
5.	Sunflowers.....tons	10·53	Wheat.....	34·3	Wheat.....	34·5
6.	Potatoes.....bu.	255·61	Wheat.....	36·3	Wheat.....	35·3
7.	Wheat.....bu.	26·10	Wheat.....	35·1	Wheat.....	29·1
8.	Wheat.....bu.	23·90	Wheat.....	28·8	Oats.....	72·1
9.	Wheat.....bu.	25·60	Oats.....	58·7	Barley.....	42·9
10.	Oats.....bu.	57·90	Oats.....	60·6	Oats.....	71·6
11.	Oats.....bu.	55·10	Oats.....	60·3	Barley.....	42·6
12.	Oats.....bu.	51·30	Barley.....	40·3	Barley.....	47·6
13.	Barley.....bu.	30·40	Barley.....	39·3	Barley.....	45·8

None of the summerfallow substitute crops leave the land so productive as the bare summerfallow. There appears to be little to choose between corn and potatoes as summerfallow substitute crops, and corn and potatoes are both better than sunflowers when the yield of the succeeding crop is considered. Sunflowers are the best intertilled weed control crop, their broad leaves shading the ground so completely that weed seedlings have little chance to develop and produce new seeds.

There appears to be little justification for summerfallowing on the black and grey soils in central Alberta unless it is necessary to control certain weeds or facilitate a certain farming program. The average yield of wheat per acre in the summerfallow, wheat, wheat, rotation of plot 1 is 27·2 bushels per acre, while the average yield of continuous wheat, plot 7, is 30·1 bushels per acre. This lack of benefit from the summerfallow is also borne out by the very satisfactory crops and yields produced on all the rotations included on plots 7 to 13. While the statement that a summerfallow may not be necessary in central Alberta may seem very radical, it is borne out by the data of this experiment and by the general farm practices followed in the park belt of the province where not more than ten per cent of the land is summerfallowed. It is further supported by the results obtained on one of the larger rotations, Rotation "K", which produces high yields of corn, wheat, barley and hay and which has not been summerfallowed since the rotation was started in 1911.

The control of weeds is a very serious problem in any grain-growing rotation. It is rather unfortunate that yields do not tell the whole story in this rotation. The facts are that the second crop following summerfallow or summerfallow substitute crops is very weedy, while all the plots from 7 to 13 are developing a very serious weed problem. While weed control practices, such as shallow tillage and delayed spring seeding help to control weeds, the trend is toward an intensified weed problem where exclusive and continuous grain-growing is practised. Wild oats have developed into a very serious problem in plots 7 to 13.

There appears to be a slight difference in the effect one crop has on another. The yields produced in the first year, plots 7, 8 and 9, indicate that the crops rate in order of barley, wheat and oats as preparatory crops for wheat. Apparently the crop which produces the highest tonnage of dry matter per acre will leave the least available plant food in the soil for the succeeding crop. It would seem reasonable to assume that there might be an even greater difference between a late-maturing, long-strawed, rank-growing variety and an early-maturing, short-strawed variety of the same crop, in their effect on the succeeding crop than there is between varieties of wheat, oats and barley which have similar growth periods and produce the same amounts of dry matter per acre.

FOUR-YEAR ROTATIONS

The object of this experiment is to secure yield data on a number of different four-year rotations.

The four-year rotations and the average yields are listed in the following table, Year 1 being summerfallow in all cases.

TABLE 25.—FOUR-YEAR ROTATIONS: 7-YEAR AVERAGE YIELDS

Rotation	Year 2		Year 3		Year 4	
	Crop	Yield	Crop	Yield	Crop	Yield
		bu.		bu.		bu.
1.....	Wheat.....	37.9	Wheat.....	30.5	Oats.....	75.4
2.....	Wheat.....	38.5	Oats.....	89.5	Barley.....	48.2
3.....	Oats.....	94.9	Oats.....	90.9	Oats.....	69.7
4.....	Oats.....	97.7	Oats.....	84.1	Barley.....	52.5
5.....	Barley.....	48.7	Barley.....	45.5	Barley.....	40.5

The rotation included in this project have produced interesting comparisons. The results substantiate those of the continuous cropping project, which show that the yield is less than where a crop is rotated and follows another kind of crop. In the fourth year oats after wheat has yielded consistently better than oats after oats; and barley better after oats than after barley. The results of this experiment indicate that it pays to diversify the crops in a straight grain rotation as much as possible. The same crops should not be grown continuously on the same land for two consecutive years unless necessary.

As was the case with the three-year rotation, the average yields produced in this rotation on stubble land are so high that there appears to be no need to summerfallow to maintain yields. The average yields, however, do not present a true picture of the results obtained. A study of the yearly yields shows that they vary and the results depend to a large extent on seasonal rainfall. The yields are high in years having a heavy precipitation and are low in dry years with limited rainfall.

No serious weed problem has been encountered in this project, which indicates that when farming operations start on clean land it is possible to use clean seed and follow suitable cultural practices and thus keep weeds under control for relatively long periods. On the other hand, experience has shown that when farming operations start on dirty land, it is almost impossible to keep weeds under control with a three- or four-year rotation. Hence, it would seem reasonable to assume that the kind and degree of weed infestation is the governing factor in the rotation which should be followed in a grain-growing program.

FERTILIZER TRIALS

Fertilizer trials have been run in conjunction with Rotation "C" (straight grain rotation) and Rotation "O" (mixed-farming rotation). Both these rotations have responded well to an application of 50 lb. of ammonium phosphate 11-48-0 applied to the wheat crops following summerfallow.

The following tables give the results of an application of 50 lb. of 11-48-0 applied to wheat after fallow on Rotation "C" and "O".

TABLE 26.—ROTATION "C"—FALLOW, WHEAT, WHEAT

Rotation Year	Crop	Treatment	Yield per acre 13-year average
1.....	Fallow.....		
2.....	Wheat.....	Check.....	21.3
2.....	Wheat.....	50 lb. 11-48-0.....	30.2
3.....	Wheat.....	Check.....	12.9
3.....	Wheat.....	Residual Effect.....	16.9

On rotation "C", the yield has been increased 8.7 bushels per acre per year over a period of 13 years and has provided some control over the wild oats. The residual effect of the fertilizer gave a yield on the second crop of wheat of 16.9 bushels per acre as compared with 12.9 bushels on the unfertilized portion, over a twelve-year period. This shows a 4-bushel increase which is attributed to the residual effect of the fertilizer applied the year previous.

Rotation "O", the mixed-farming rotation, has given an average yield increase of 11.6 bushels per acre per year over the unfertilized portion.

The above figures of yield increases show the value of an application of 50 lb. of ammonium phosphate, 11-48-0, under conditions such as prevail in Rotation "C", where the practice of having a straight grain rotation which puts nothing back into the land has resulted in depleted fertility; and in Rotation "O", the mixed farming rotation, which has, besides a legume and grass hay crop, an application of 15 tons of barnyard manure applied in the seventh year.

Therefore, it can be said that an application of 50 lb. of ammonium phosphate, 11-48-0, is profitable on the black soils of central Alberta.

The results obtained from other fertilizer tests prove that the three main elements in commercial fertilizers—nitrogen, phosphorus and potassium—show a different response and also that the various soil types within any one soil zone will react differently to fertilizers depending on what elements are lacking in a particular soil.

TABLE 27.—ROTATION "O"—POTATOES, WHEAT, OATS, FALLOW, WHEAT, HAY

Rotation Year	Crop	Treatment	Yield per acre 5-year average
5.....	Wheat.....	Check.....	45.7
5.....	Wheat.....	50 lb. 11-48-0.....	57.3

Experiments with different rates of application have shown that the yield increases will vary with the available soil moisture and in the various soil types of the district served by this Station. In the drier parts the amount of fertilizer applied should be reduced.

Sometimes the opinion is expressed that fertilizers impoverish the soil or affect it detrimentally. Experiments at the Lacombe Station show that there is no basis for this opinion in the case of fertilizers commonly used. The only effect that the discontinuation of the use of commercial fertilizers will have on the crops is that the yield of the crop will drop to about the same level at which it would have been had fertilizers never been used.

Commercial fertilizers are increasing in importance in central Alberta. The use of suitable fertilizers tends to increase yields and hasten maturity, and also assists in controlling weeds, plant diseases, insect damage, and, in general, help to overcome many of the hazards of crop production. The fertilizers available on most farms include barnyard manure, green manures and clovers. On the average farm, the supply of barnyard manure is not sufficient to meet the fertilizer requirements. The farmer should use manure in such a way that it will spread over as large an area as possible. This will give greater immediate returns per ton than if it is spread at a heavy rate; ten to fifteen tons per acre will give satisfactory results. Manure is not in itself a well balanced fertilizer since it is relatively low in phosphorus. Manure is valuable because it improves the physical condition of soils that are deficient in organic matter and increases their moisture-holding capacity.

Experiments at Lacombe have also shown that green manures and clovers, when used as fertilizers, are valuable since they add organic matter to the soil and often improve the physical condition of the soil and increase the availability of plant nutrients. When legumes are inoculated, they have the power to utilize atmospheric nitrogen but if taken off as a hay crop most of this nitrogen is lost to the soil. However, it must be remembered that legume crops, in general, are helpful in building up soils.

Fertilizers will not take the place of good farming practices and the following points must be remembered (1) use mixed farming rotations that include legumes where possible; (2) practise good cultural methods; (3) make the best use of farm manure; and (4) add commercial fertilizers where required.

FERTILIZERS FOR HAY CROPS

Fertilizers for grasses and clovers in the black soil areas have not given consistent results. While none of the fertilizers have produced significantly higher yields, it can be safely assumed from results obtained at this station and from other data obtained in the same soil zone that nitrogenous fertilizers influence the yield to a greater extent than the phosphate or potassium fertilizers. Fertilizers for hay and pasture crops should be tested on a small scale at home and if they prove profitable they can be applied on a large scale.

CULTURAL PROJECTS

The cultural experiments were concluded in 1944 and a new set laid down in 1945. These new experiments have produced only one year's results which are not conclusive. Herein will be recorded the data from the previous work in the cultural plot field.

CROP SEQUENCE

The object of this experiment is to determine the influence of various crops on the yields of succeeding crops of wheat in a four-year rotation in which wheat is grown in the third and fourth years following the various crops listed here: wheat, oats, corn, sunflowers, potatoes, sweet clover; and two-year crops of timothy, crested wheat grass, brome and alfalfa.

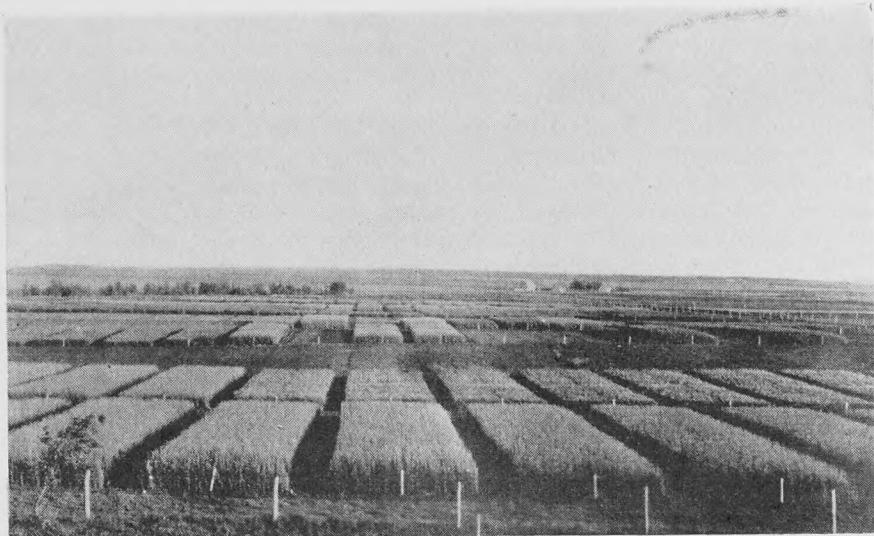


Fig. 11.—Cultural and Fertilizer Plots at Lacombe, Alta.

It will be seen from Table 28 which gives seven-year average yields, that in the third year the wheat following wheat appears to decrease the yield more than any of the other crops with oats, timothy and brome grouped behind it. Corn, potatoes and sunflowers are very suitable as summerfallow substitutes, yields after these crops being comparable to those after summerfallow. The response of wheat to grasses and legumes is somewhat as might be expected, in that the wheat yielded a little better on grass sod than on stubble land and better on legume sod than grass sod, particularly when both the third and fourth years of the rotation are taken into consideration.

TABLE 28.—SEQUENCE OF CROPS EXPERIMENT
(7-Year Average Yields)

Plot No.	Year 1		Year 2		Year 3		Year 4	
	Crop	Yield	Crop	Yield	Crop	Yield	Crop	Yield
1.....	Fallow.....		Wheat.....bu.	29·4	Wheat....	22·5	Wheat....	21·8
2.....	Fallow.....		Oats.....bu.	71·5	Wheat....	25·9	Wheat....	22·9
3.....	Fallow.....		Fallow.....		Wheat....	37·2	Wheat....	25·0
4.....	Fallow.....		Corn.....tons	8·32	Wheat....	38·6	Wheat....	16·1
5.....	Fallow.....		Sunflowers.....tons	9·42	Wheat....	31·7	Wheat....	24·5
6.....	Fallow.....		Potatoes.....bu.	241·00	Wheat....	34·7	Wheat....	25·2
7.....	Barley.....bu.	28·1	Sw. Clover.....		Wheat....	28·8	Wheat....	21·3
8.....	Timothy.....		Timothy.....tons	1·77	Wheat....	26·2	Wheat....	23·7
9.....	Cr. Wheat.....		Cr. Wheat.....tons	1·58	Wheat....	27·9	Wheat....	21·9
10.....	Brome.....		Brome.....tons	2·09	Wheat....	26·2	Wheat....	20·1
11.....	Alfalfa.....		Alfalfa.....tons	1·63	Wheat....	27·0	Wheat....	25·9

While the different treatments affected the yields of the third year, their effect on the control of weeds is most noticeable in the fourth. For that reason the notes taken in connection with the influence of the different rotations on weed control are summarized:

1. Wheat after fallow yields well and is a clean crop but the third wheat crop after fallow is a very weedy and poor crop.
2. Oats after fallow is a good crop and reasonably free from weeds and the wheat crops following oats are better than the wheat crops following wheat but are still quite weedy.
3. Two years summerfallow produces a good crop of wheat but this crop also contains a few weeds.
4. Wheat after corn is an excellent crop, the benefits of the corn appear to carry over into the fourth year.
5. Wheat after sunflowers is not so heavy a crop as that following corn but it is freer from weeds, as a result of sunflowers being a better smother crop than corn.
6. Wheat after potatoes is an excellent crop and reasonably free from weeds. Weed control with potatoes depends to a large extent on the thoroughness of the cultivation given to the potato crop. If late weeds are allowed to ripen seeds, the succeeding crop will be weedier than if no intertilled crop was grown.
7. The barley, sweet clover, wheat, wheat, rotation is not productive of data which would evaluate sweet clover as a summerfallow substitute crop because of failure to secure a normal stand of sweet clover.
8. The crop of wheat after timothy is only fair and wild oat control in this rotation is not so effective as anticipated.
9. The rotation which includes crested wheat grass does not function as well as it should. This rotation started out with western rye grass but the crested wheat was substituted for the rye grass. Poor stands of rye grass and crested wheat grass were obtained throughout the test and the yields presented are more representative of what could be expected after summerfallow.
10. The effect of brome on succeeding wheat crops is somewhat similar to that of timothy. There appeared to be little difference in the control of weeds by these two grasses.
11. Wheat after alfalfa is not as good as anticipated. Alfalfa seems to utilize all available moisture and the beneficial effect of the alfalfa shows up to a greater extent in the fourth year than in the third in a better and cleaner crop.

CULTURAL TREATMENTS FOR HAY CROPS

The object of these experiments is to determine the influence of various cultural and fertilizer treatments for hay crops in order to maintain a high yield.

Brome Grass.—Observations made in the field and data collected in this project indicate that the best way to maintain yields of hay on brome sod is to disk in the fall and drill in 20 pounds of sweet clover seed in the spring. Later experience has shown that as good or better results might be expected if the sweet clover is seeded in the fall just as the ground is freezing up or during periods of light snowfall during the winter, so that moisture from melting snow will be available for germinating the sweet clover seed.

The use of commercial fertilizers has not increased the yield per acre. It is hard to understand why this is the case but apparently fertilizers have but little effect on the growth of grass on the dark loam soils of the park belt. It is believed, however, that quite different results might be secured with different soils and climatic conditions.

Ploughing brome grass sod appears to be beneficial but ploughing alone is not as good as when further treatment is given. Fertilization, after ploughing and working down the sod, results in a slight increase in the yield.

A large field of brome on the Station was rejuvenated in the following way. The sod was ploughed early in the spring about six inches deep. It was worked down at once and seeded with five pounds of alfalfa per acre. Ploughing, and other operations thinned out over 80 per cent of the brome, and the alfalfa developed to the bloom stage the same year. The first year's growth was grazed off after October 1 and the field has consistently produced an excellent stand of mixed brome and alfalfa hay ever since receiving the above treatment.

The experience with this project and its application under field conditions, leads to the recommendation that sweet clover should be used for a temporary rejuvenation but if it is the intention to leave the land in meadow for a number of years, five pounds of alfalfa per acre should be included in the seeding mixture.

If the meadow to be rejuvenated is located on black loam or sandy loam soil, it is doubtful if the expense involved in applying a commercial fertilizer is justified, but if a clay soil is involved, it is believed that an ammonium phosphate fertilizer can be used to advantage. This latter recommendation is based on experience with fertilizers at Illustration Stations located in the grey wooded soil area.

Timothy.—Double-disking timothy sod in the fall and fertilizing with 100 lb. of ammonium phosphate 16-20-0, and seeding with 20 lb. of sweet clover in the spring has given the largest increases in hay yield. While this treatment has produced increased yields per acre, the increases are not large. As is the case with brome, it is believed that much larger increases would result if a different legume were included, such as alfalfa, in the seeding mixture. It is also believed that much larger responses would result in clay soils, such as are found in the grey wooded soil areas. Excellent results have been obtained where legume seed and ammonium phosphate 16-20-0, have been drilled in timothy sod at Illustration Stations in the grey wooded soil area.

Alfalfa.—The different cultural and fertilizer treatments given alfalfa in this experiment have not materially influenced the yield per acre. A combination of cultural and fertilizer treatments has exerted the greatest influence. The time of the cultural treatment and application of the fertilizer appeared to have little effect on the yield. There also appears to be no advantage in favour of a heavy application of commercial fertilizer and it is possible that an even lighter application would be as beneficial as the heavier rate.

In considering the data recorded under this project, it should be borne in mind that the check plots have produced high yields even when no cultural or fertilizer treatment is given. The rich, sandy loam soils of the park belt give high yields without fertilizer treatment and it does not seem to be necessary to use commercial fertilizers in order to secure good crops.

Experiments conducted at different Illustration Stations located in the grey wooded soil area have shown that quite different results may be expected under different soil and climatic conditions, particularly on the peat and clay soils of that area.

CONTINUOUS CROPS

The object of this experiment is to determine the relative yields of different crops grown continuously; also to determine the response of various continuous crops to fertilizer. The relative influence of continuous cropping and rotations on the yield of various crops is also being studied.

The data compiled in this experiment indicate that crops can be grown continuously on the same land for a number of years without a very serious decrease in the yield.

Grass, alfalfa and corn appear to be the only crops which lend themselves well to continuous cropping when fertilizer is used to hold the fertility of the land up to a reasonably high level. The development of diseases in epidemic proportions occurs when sunflowers and potatoes and grain are grown continuously. Weeds, especially wild oats, make the continuous growing of grain crops a very questionable practice.

In summarizing this project, it can be said that while the yields for the seven-year period have been reasonably satisfactory, the weed and disease problem is developing so rapidly that the continuous growing of the same crop would be a very unsatisfactory farm practice. There appears to be a definite limit beyond which it is not advisable to continue to grow the same crop on the same land. This limit varies with different crops and would probably vary with different soil and climatic conditions.

The application of fertilizer results in an increased yield per acre on all of the plots but under a continuous cropping system it is necessary to use a larger amount of fertilizer to maintain production than under a system which includes a mixed farming rotation.

COVER CROPS EXPERIMENT

The object of these experiments is to determine the effect of various cover crop treatments in comparison with different summerfallow treatments on the yield of subsequent crops of wheat and also their effectiveness in controlling soil drifting.

These experiments have shown that the production of a suitable cover crop on summerfallow does not appreciably reduce the yield of the following crop of wheat in the blacksoil areas of central Alberta. The best results are obtained when the cover crop is seeded close to August 1. If the cover crop is seeded earlier, it tends to develop more than the necessary amount of growth and does not permit effective weed control. The extra growth attained by seeding earlier than August 1 tends to reduce the yield of the following crop. When the cover crop is seeded on August 15 or later, it does not make enough growth most years to provide much fall grazing.

Cover crops seeded in rows 12 inches apart have no advantage over normal seeding procedure but have the disadvantage that they do not provide as much feed as if normally spaced.

Field observations and data compiled in this project indicate that the ideal summerfallow for the park belt should receive shallow tillage to maintain as much trash cover as possible. It should also be provided with winter protection by a cover crop of wheat or oats seeded around August 1 so that in a fall or spring having high winds it will have some protection and will not drift.

FORAGE CROPS

H. B. Stelfox

The increasing importance of forage crops in Alberta is reflected in the substantial increase in acreage devoted to these crops during the past decade. In 1937, only 442,200 acres were utilized for forage production, while by 1946 the acreage had increased to 858,200 acres. A large proportion of this acreage is located in central Alberta.

Experiments with forage crops at this Station have provided a much needed stimulus to forage production in the area served and have provided the answers to many of the production problems which have arisen. The experiments conducted include variety and strain testing, pasture tests, hay tests, dates of seeding tests, forage crop nursery, triticum-agropyron hybridization test and seed production tests.

VARIETY AND STRAIN TESTING

The testing of promising varieties and strains of all forage crops suited to production in central Alberta has been under way since the inception of this Station. A short discussion of the most promising varieties of these crops are given below.

ALFALFA

Alfalfa variety tests conducted during the ten years under review indicate that the varieties Grimm, Ladak, Viking, Cossack and Ontario Varigated are the most winter-hardy and productive. The difference in yield between these varieties has not been great but Ladak has slightly outyielded the others. This fact, coupled with the increasing importance of the need for a more wilt-resistant variety to replace Grimm, has resulted in an increase in the production of Ladak in recent years. The variety Ferax has not been as high yielding for hay as the above-mentioned varieties but because of its superior seed-setting ability the acreage devoted to this variety has increased in the seed producing areas of Alberta.

Alfalfa continues to rate as the most important forage legume in central Alberta. Winter crown-rot is the disease of greatest economic importance in the district at the present time but bacterial wilt is increasing in prevalence. High yielding varieties resistant to these diseases are becoming of increasing importance.

SWEET CLOVER

Many white- and yellow-blossomed varieties of the tall and dwarf types of sweet clover have been under test for some years. The dwarf-type varieties are, on the average, somewhat lower yielding but their superior forage quality due to finer stems and higher proportion of leaf makes them the more desirable for hay. Alpha and Brandon Dwarf are two varieties of the dwarf type. Of the tall-growing types, the yellow- and white-blossomed varieties have yielded about equally well but the former has somewhat finer stems and leaves. Redfield yellow is the highest yielding yellow-blossomed variety but it is approximately two weeks later maturing than Erector, the next highest yielder. Arctic is very resistant to root-rot and winter-killing and is the most satisfactory of the tall, white-blossomed varieties.

The acreage devoted to sweet clover production in central Alberta has increased considerably in recent years. There has been a very substantial increase in seed production, likewise a large increase in the acreage used for hay,



Fig. 12.—Sweet clover grown in rows and being harvested for seed with a binder.

and a larger acreage is being ploughed down for soil improvement purposes. Sweet clover is most useful in short rotations, especially on central Alberta's grey bush soils.

RED CLOVER

The production of the single-cut type of red clover continues to predominate in Alberta, practically to the exclusion of the double-cut type. The Altaswede variety has proved to be one of the hardiest and heaviest yielding single-cut varieties tested. It is the only variety grown commercially in Alberta. The need, however, still exists for a winter-hardy, early-maturing, double-cut red clover adapted to central Alberta conditions. A breeding project with this goal in mind recently has been initiated.

Red clover is particularly adapted to the grey wooded soil area of Alberta where it is being grown extensively as a hay crop, usually in combination with timothy, and as a seed crop. An early-maturing, winter-hardy, double-cut variety would produce a hay crop of better quality than the coarse-stemmed Altaswede or a seed crop that could be harvested early in the season when harvesting conditions are at their best.

ALSIKE CLOVER

The commercially grown strain of alsike has been tested for hay, against red clover varieties, for several years. Alsike is hardier than red clover and produces hay yields equal to those of Altaswede. Like red clover, it does particularly well on the grey wooded soils when suitable fertilizers are applied. For hay purposes, it is usually grown in combination with timothy and thrives under moist conditions. A large proportion of the alsike seed produced in Canada is harvested from Alberta's grey wooded soils.

To date, no named varieties have been tested at this Station which have proved equal, or superior to, the commercially grown strain.

WHITE CLOVER

Common white Dutch is the white clover variety most widely grown Alberta. It has volunteered freely along roadsides and in wooded areas where moisture is abundant. It is winter-hardy and has been the most productive of the varieties tested. Ladino is a mammoth-type variety of white clover which has gained prominence for use in pasture mixtures in Eastern Canada and in northeastern United States. In central Alberta, however, it winter-kills approximately 50 per cent each year and for this reason is not widely grown here.

White clover is essentially a pasture plant although it is sometimes included as a bottom legume in hay-pasture mixtures. It is not cultivated extensively in central Alberta but is included in some pasture mixtures for moist locations to the extent of 1 to 2 pounds per acre. The difficulty experienced in harvesting white clover seed has resulted in seed prices being high and has prevented a more widespread use of this crop.

TIMOTHY

The difference in yield between the varieties of timothy tested at Lacombe have not been large. Quality of forage based on leafiness has been used in conjunction with yield to evaluate the various strains and varieties tested.

Montcalm, Swallow and Cornell 1777 have been the highest yielders among varieties originating at the University of Alberta, is now being grown to a limited extent in the province.

Timothy is well adapted to the soil and climatic conditions of west-central Alberta where it continues to be the most important cultivated grass species grown. It is widely used both for hay and pasture purposes usually in conjunction with adapted legume species.

BROME GRASS

A comparison of the Commercial and Parkland strains of brome has indicated that over a period of years Parkland has yielded slightly heavier than Commercial both in pure stands and in mixtures with alfalfa. Parkland does not creep as vigorously as the Commercial strain and for this reason retains its productivity for a longer period of time.

A uniform brome variety test established in 1945, in which nine varieties are included, indicates that the southern-grown, United States strains of Lincoln, Fischer and Achenbach are lower yielding than northern-grown Canadian strains during the first crop year at least.

Brome grass is very well adapted to the parkland area and the dark brown soil zone of central Alberta. At the Lacombe Station it outyields timothy by approximately one-third of a ton of hay per acre and is used extensively for hay and pasture, usually in a mixture with alfalfa.

CRESTED WHEAT GRASS

The Fairway strain of crested wheat grass has replaced the standard strain to a large extent because of its finer-stemmed and leafier character. Both varieties have yielded equally well at this Station.

Where drought resistance is important, crested wheat grass is one of the best forage grasses. It has not yielded so well as slender wheat grass in trials, but because it persists as a long-lived perennial it is usually preferred. Its early-spring growth and late-fall recovery makes it a valuable pasture grass during those periods of the year. Its extensive fibrous root system is important in preventing soil erosion and in building up the fibre content of the soil.

SLENDER WHEAT OR WESTERN RYE GRASS

The results of a five-year test of three varieties of slender wheat grass have shown Grazier to be superior in yielding ability to Fyra and Mecca and to produce a forage of acceptable quality. Fyra is a slightly lower yielder but produces a finer quality forage.

Slender wheat grass has declined in popularity in central Alberta in recent years because of its tendency to behave as a short-lived perennial. Stands kill out badly when two or three years old. Crested wheat grass has replaced most of the acreage previously devoted to slender wheat grass and is considered to be a more suitable grass for inclusion in hay and pasture mixtures where the crop is to be left down for more than two years.

MISCELLANEOUS GRASS SPECIES

Several other grass species, of which only a few named varieties are at all available, have been tested in a miscellaneous grass species test against some of the grass species already discussed. A comparison of the yields of these grasses with those of Mecca western rye and Fairway crested wheat are shown below in Table 29.

TABLE 29.—A COMPARISON OF AVERAGE HAY YIELDS OF VARIOUS GRASS SPECIES

Species	5-year average (1935-39) tons of hay per acre
Mecca western rye grass.....	2.96
Fairway crested wheat grass.....	2.74
Meadow fescue.....	1.85
Reed canary grass.....	1.46
Red top.....	1.31
Creeping red fescue.....	1.30
Kentucky blue grass.....	1.11
Meadow foxtail.....	1.08
Orchard grass.....	0.52

The yields shown in table 29 are averages of yields of one-year-old stands only, and, consequently, do not give a true picture of the longevity of the different species.

Meadow fescue produces a forage of fair quality but lacks sufficient winter hardiness for central Alberta. It has shown a tendency to die out after the first hay crop has been taken off. Its production is not recommended for this area.

Reed canary grass is a native species which produces heavy yields of relatively coarse forage on low, wet land. On high land where moisture is lacking, the yields are not usually so high as for brome grass. To obtain good quality reed canary grass hay, the crop should be cut in the early-heading stage. This grass is particularly adapted to low land which is subject to flooding.

Red Top is also a native species and is adapted to low, wet, acid soils. It lacks yielding ability on higher land and the quality of forage is just fair. Its use should be restricted to low wet areas and acid soils.

Creeping red fescue is the only fescue which is grown extensively in Alberta. It is lower yielding than most of the other commonly-grown grass species but is

winter-hardy and is an excellent turf grass. Its foliage remains green well into the winter and makes excellent late fall grazing. It is used in pasture and hay-pasture mixtures and is a good lawn grass.

Kentucky blue grass does best when an abundance of moisture is available and is very low yielding under dry conditions. It produces a forage of excellent quality but because of the relatively low yields produced under central Alberta conditions its use is limited to pasture mixtures and for lawns. Kentucky blue grass has proved superior to Canada blue grass for both hay and pasture at Lacombe.

Meadow foxtail produces a very early growth that is both leafy and succulent. However, it is a relatively low yielder and the seed is light and fluffy making it very difficult to handle. It is not being grown commercially in Alberta.

Orchard grass lacks sufficient winter-hardiness for production in central Alberta. It completely winter-killed in three of the years it was under test at Lacombe and was seriously damaged in the remaining ones. It produces forage of excellent quality and is a valuable hay and pasture grass in areas where winter-hardiness is not a limiting factor.

CORN

Twenty-six varieties and hybrids of both the dent and flint types of field corn have been tested for fodder purposes at the Lacombe Station during ten years under review. Of this number only a few are sufficiently early maturing to be of any value in this area; they include Saskatchewan White Flint, Gehu and Northwestern Dent. Quebec No. 28 is slightly later maturing but is a better type of silage corn because of the large number of tillers produced and the ears are borne well up on the stalks.

The seasonal variations in corn yields at this Station have been very noticeable. Fluctuations in seasonal mean yields as large as $2\frac{1}{2}$ tons of dry matter per acre have been observed. Early fall frosts have been the primary cause of these fluctuations.

The acreage devoted to the growing of fodder corn in Alberta decreased from 2,700 acres in 1937 to only 700 acres in 1946. Practically all of this acreage is located in southern Alberta.

ROOT CROPS

Root crops grown as feed for livestock have continued to play an almost negligible role in the farming program of central Alberta. The hand labour involved in their production and utilization together with existing crop production hazards are the main factors responsible for this situation. The place occupied by roots in livestock feeding in the older agricultural countries of the world is being partly replaced in Alberta by rape and cover crops which are grazed during the fall and early winter by cattle and sheep.

Several variety tests of mangels and swede turnips have been made at this Station during the ten years under review. Of the swede varieties, Acadia has been one of the most promising followed closely by Ditmars. Tip Top and Prince White Sugar are two of the best mangel varieties tested here.

Swede turnips have been a more dependable crop over a period of years than mangels since they have not been so subject to damage by late spring frost and cutworms.

PASTURE TESTS

During the ten years covered by this report a considerable amount of data has been obtained from annual and perennial pasture tests which have been conducted at this Station. In 1940 a publication, entitled "Improved Pastur-



Fig. 13.—Farmers discussing pastures at a field day held at the Dominion Experimental Station, Lacombe.

Crops and Pasture Practices for Central Alberta", was published bringing together the information obtained from pasture studies conducted at the Lacombe Station to that date.

A brief summary of these pasture studies will be given below. For a more detailed discussion of this work the reader is referred to the publication cited above which is listed as the Dominion Department of Agriculture Farmers' Bulletin No. 93.

ANNUAL PASTURE CROPS

Annual pasture crops are important to the livestock-producing industry of central Alberta where they are used as supplementary pastures for cattle, horses and sheep and constitute the principal cultivated pasturage for hogs and poultry. A large number of different crops including the cereal grains, rape, millets, soybeans, sweet clover and alfalfa have been tested for this purpose at the Lacombe Station for a number of years. The following statements and observations can be made from the results obtained.

Oats are more satisfactory for annual pasture than either barley or wheat because of the higher yield of forage produced. Late-maturing varieties of oats make better pasture crops than early-maturing varieties. Oats alone do not yield as much forage as when combined with other crops such as fall rye or rape.

A mixture of two bushels of oats and one bushel of fall rye has outyielded all other crops and mixtures tested and is considered to be one of the best annual pasture crops for central Alberta. A mixture of two bushels of oats and ten pounds of rape produces a good yield of high-protein forage and provides good pasture for late fall as well as for summer. Two bushels of oats and one bushel of peas gave a fair yield of high-protein forage but it is doubtful if this mixture would stand pasturing as well as the two previous ones.

Neither alfalfa nor sweet clover are to be recommended for annual pasture because the cost of alfalfa seed is usually high and both crops are not highly

productive during the first year of growth. Soybeans, Siberian and hog millet likewise have proved unsatisfactory. Neither the yield nor the quality of the forage produced is equal to that of oats and some of the other annual pasture crops. They are also subject to damage by freezing temperatures, and, in addition, make a slow growth in the seedling stage and do not compete well with weeds.

BIENNIAL AND PERENNIAL PASTURE CROPS

An experiment designed to provide information on the suitability of different grasses and legumes grown alone and in mixtures for pasture purposes was seeded in 1932 and again in 1933. The following species were included in the test: brome, western rye grass, crested wheat grass, timothy, Kentucky blue grass, reed canary grass, yellow-and white-blossom sweet clover; alfalfa, red clover, alsike, white dutch clover, orchard grass, yellow trefoil, meadow fescue and creeping red fescue. In addition to obtaining comparative yield data and protein analysis, information was obtained on the effect of fall clipping on the amount of winter-killing sustained during the first year.

A brief summary of the information obtained is itemized below:

(1) The average yield of dry matter and protein produced per acre showed that late fall clipping was preferable to early clipping, but the yield produced the following year by any of the fall-clipped plots did not equal the yield of those which went through the winter with the first season's growth intact.

(2) The average yields of individual plots indicated that the grasses give a different response to fall clipping than do legumes. Grasses appear to benefit by early fall clipping while clipping late in the fall has a harmful effect. In the case of the grasses, the late fall clipping leaves the ground bare with no vegetation to hold the snow and protect the roots; with the result that there is a loss of vigour and a certain amount of winter injury following the late fall clipping which in turn results in reduced yields the following season.

(3) It was also determined that the period August 15 to September 15 apparently is a critical period in the autumn growth of alfalfa during which time harvesting or grazing does the most damage to this crop. The food reserves stored in the roots are used for the purpose of producing additional above-ground growth and the roots are left in a weakened condition when winter sets in. It is recommended that legumes be grazed very lightly or not at all during this critical period.

(4) The high yields produced by the brome, timothy, alfalfa and sweet clover individual seedlings and mixtures indicated the desirability of using these species in pasture mixtures.

(5) The fact that the crops mentioned in (4) outyielded the drought-resistant crops, such as rye grass and crested wheat, indicated that where sufficient moisture is available to produce these crops to advantage, as is the case in the park belt of Alberta, pasture mixtures should not contain a high percentage of drought-resistant crops.

(6) Orchard grass, meadow fescue and yellow trefoil are not sufficiently winter-hardy for pasture purposes in central Alberta.

HAY TESTS

Extensive hay tests of annual, biennial and perennial forage crops have been conducted at the Lacombe Station during the past decade. The results obtained are briefly summarized.

ANNUAL HAY CROPS

A large number of different forages alone and in mixtures have been tested each year, from 1933 to 1945 inclusive, to determine their value as annual hay crops. The cereal crops have consistently produced the highest average yields

of forage of all the crops tested. Oats have proved superior to the other cereal crops both in yield and quality of forage. The choice of which oat variety to use should be based on high yield coupled with good forage quality. Victory has given a good account of itself for this purpose and a more recent variety, Larain, shows considerable promise. An early-maturing variety has the advantage of being better adapted for use as a cleaning crop when being grown as an annual hay.

The addition of other crops such as peas, vetch, millet, sudan grass, and sweet clover, to oats appeared to have little effect on either the yield or the quality and palatability of the fodder produced since the oats make such a vigorous growth that they tend to smother the companion crops. On lighter soils the competition would not be expected to be as great.

The millets, sudan grass, soybeans and other similar, heat-loving crops have a very limited value in central Alberta as annual hays because of their susceptibility to frost and the relatively short frost-free period of the area. In seasons when early fall frosts did not occur high yields of Siberian millet were obtained.

The grasses and legumes normally grown as biennial and perennial hay crops generally do not produce sufficient forage the first year to warrant their use as annual hay crops. In addition the cost of seed of some of them is prohibitive for this use.

BIENNIAL AND PERENNIAL HAY CROPS

In addition to the hay yield data obtained from the variety tests of the various grass and legume species already discussed, considerable data has been obtained from two grass-alfalfa hay tests laid down in 1937 and 1941 respectively. The 1937 seeding included timothy and alfalfa, brome and alfalfa, and crested wheat and alfalfa mixtures; the grasses being seeded at five different rates and the alfalfa at three. In addition, the three grass species and alfalfa were seeded alone at two different rates. This seeding was left down for a five-year period. Hay yields and the percentages of grass and alfalfa in the hay mixtures were recorded.

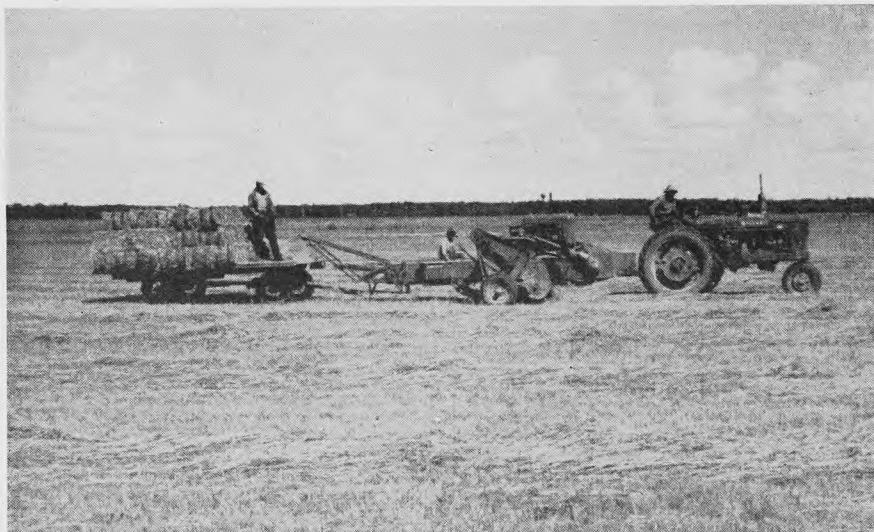


Fig. 14.—A pick-up baler provides a convenient means for handling hay especially where the hay is to be hauled considerable distances or is to be shipped to outside markets.

The second hay test, seeded in 1941, was a modified version of the 1937 seeding. Hay yields and the percentages of grass and alfalfa in the mixtures were recorded for a three-year period for this test.

An examination of the results obtained from these two tests showed that lower rates of seeding than those commonly being used at that time resulted in yields equally as good as those from higher rates of seeding. In addition, it was found that when brome grass is seeded heavier than six pounds per acre in a mixture with alfalfa the brome suppresses the alfalfa considerably during the first three years and results in a hay mixture consisting of approximately two-thirds brome and one-third alfalfa. For hay mixtures, a proportion of approximately fifty-fifty grass and legume is usually desired whereas for pasture purposes a higher percentage of grass lessens the likelihood of bloat.

It was also possible to determine the optimum rates for seeding alfalfa-grass mixtures for hay in central Alberta. They are listed as follows:

(1) { Alfalfa—7 lb. Timothy—3 lb.	(2) { Alfalfa—7 lb. Brome—6 lb.	(3) { Alfalfa—7 lb. Crested Wheat—7 lb.
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The above mixtures produced the highest hay yields per acre and the resulting hay was about 50 per cent grass and 50 per cent alfalfa.

The seeding of a mixture of a grass and legume for hay is preferred to the seeding of either alone. Mixtures add both fibre and fertility to the soil and give higher yields than pure stands. Table 30 gives the average yields of the three grass species and alfalfa seeded alone and in mixtures for the two tests conducted. The yields presented are averages of all the different rates of seeding used.

It will be observed in Table 30 that in all but two cases the average yields for mixtures were higher than those for the pure species making up the mixtures. The two exceptions are the timothy-alfalfa mixtures of the 1937 seeding. The relatively dry seasons prevailing during the 1938-42 period are responsible for r



Fig. 15.—A small motor-driven escalator facilitates the transfer of hay bales from truck to hay loft.

TABLE 30.—AVERAGE YIELDS OF TIMOTHY, BROME, CRESTED WHEAT AND ALFALFA
ALONE AND IN MIXTURES FOR HAY

Specie or Mixture	Tons of hay per acre (12% moisture)		
	1937 Seeding		1941 Seeding
	3-yr. av. (1938-40)	5-yr. av. (1938-42)	3-yr. av. (1942-44)
Crested wheat grass.....	1.88	1.37	1.66
for Timothy.....	1.32	1.06	1.79
Brome.....	2.23	1.77	2.10
Alfalfa.....	1.92	1.80	1.79
Alfalfa and crested wheat.....	2.09	1.92	2.02
Alfalfa and timothy.....	1.88	1.80	2.45
Alfalfa and brome.....	2.29	2.09	2.26

the low yields of timothy and timothy-alfalfa mixtures. The very favourable showing of timothy and timothy-alfalfa mixtures in the 1941 seeding was due to the favourable moisture conditions existing during the 1942-44 period.

DATES OF SEEDING TESTS

In 1932, a project was started in an endeavour to determine the most satisfactory time of year for seeding the grass and legume species commonly grown in central Alberta. Seedings were made on the first of each month commencing as early in the spring as possible and continuing until just prior to freeze-up in the fall. Each seeding was left down for a three-year period or as long as was practical. Hay yields were harvested from all plots and observations recorded on the percentage of winter-killing, etc. This project was continued until 1942 at which time sufficient data had been obtained to warrant its discontinuance.

Table 31 shows the average hay yields for the first crop year of ten grass and legume species seeded at monthly intervals from early spring to late fall from 1932 to 1942 inclusive.

Table 31 shows that grasses and legumes seeded up to and including July 1 produced satisfactory yields of the hay the following year. The yields of hay from legume stands established after July 1 were substantially lower than those for earlier seedings. For the grass species, however, August 1 seedings, although lower yielding than earlier ones, produced satisfactory yields of hay the first crop year. The first-year hay yields of the grass species seeded during September and October were higher than for the legumes seeded at the same time but were much lower than for earlier seedings.

Experience has shown that for the park belt of central Alberta June is an ideal month for the seeding of grasses and legumes. The highest monthly precipitation comes in June and seedings made then become well established and can withstand any hot summer weather or a severe winter. Spring seedings made prior to June are likewise very satisfactory except in seasons when cut-worms are likely to be prevalent.

Legume seedings should not be made later than August 1 unless they are made just prior to freeze-up. In such cases, the seed does not germinate until the following spring. Occasionally satisfactory stands of legumes are obtained by late fall seeding but the practice is not to be generally recommended.

TABLE 31.—LONG-TERM AVERAGE HAY YIELDS FOR TEN GRASS AND LEGUM SPECIES SEEDED AT MONTHLY INTERVALS THROUGHOUT THE GROWING SEASON

Species	Date of Seeding							
	Apr. 20	May 1	June 1	July 1	Aug. 1	Sept. 1	Oct. 1	Oct.
Alfalfa.....	3.64	2.49	3.11	2.81	1.33	0.51	0.48	1.0
Sweet clover.....	0.57	1.64	2.12	2.34	0.96	0.12	.....	0.3
Red clover.....	1.77	2.06	2.40	2.00	.....	.....	.....	im
Alsike.....	1.53	1.90	2.20	1.51	0.73	0.40	.....	th
Timothy.....	3.30	2.65	2.80	2.75	2.55	1.55	0.42	1.2
Brome.....	4.12	2.53	2.91	2.94	2.29	1.44	0.62	1.0
Crested wheat.....	4.51	2.34	2.91	2.86	2.43	1.87	0.43	0.3
Reed canary grass.....	2.63	2.94	2.73	2.39	1.86	1.48	0.89	1.6
Cr. red fescue.....	2.44	2.54	2.80	2.98	2.02	1.36	0.32	0.8
W. rye grass.....	3.54	2.17	2.64	2.59	2.40	1.68	0.57	0.5

* One year only.

Grass seedings made up until September 1 are usually satisfactory provided moisture conditions are adequate to establish a good stand. Seedings should not be made later than September 1 except where seeding is done just before freeze-up. Grass seedings made at this time have been much more successful than for legumes. Usually, however, satisfactory hay yields are not obtained until the second year after seeding.

FORAGE CROP NURSERY

For several years, some two hundred and fifty different kinds, varieties and strains of various crops were grown in the forage crop nursery for observational purposes. The larger number of these either killed out or failed to produce seed. In 1938, forty-one different varieties and species of crops which withstood the winter conditions were transplanted to a new location. A number of these were native species while eight of them were selections made from different strains of creeping red fescue. Three of the creeping red fescue strains appeared most promising from the standpoint of forage and seed production. Many of the selections of creeping red fescue that have been good forage types have lacked the ability to produce satisfactory seed yields. For this reason, these three promising selections have been watched with much interest in the hope of combining both desirable characteristics into one strain. A small quantity of seed was secured from these selections for testing purposes.

The forage crop nursery was temporarily discontinued during the war years but is being re-established.

TRITICUM-AGROPYRON HYBRIDIZATION

Work has been under way for several years at the Forage Plants Division of the Central Experimental Farm, Ottawa, in an endeavour to obtain a large seeded perennial grass suitable for seeding through the ordinary grain drill and adapted to the dry conditions existing in the southern portions of the Prairie Provinces. Several varieties of winter wheat have been crossed with different wheat grass species and selections have been made from the resulting progeny.

In 1938 one hundred and fifty different lines of these triticum-agropyron hybrids were tested at this Station for their general adaptability to central Alberta conditions. Of 4,650 plants established in the nursery in the spring, 3,926 plants were living and appeared quite thrifty in the fall. Only approximately one-third of this number produced heads. Upon examination, the majority of florets appeared to be sterile and only on an occasional head was there any seed formed. The majority of the plants appeared to be annuals.

Only 6 of the original 4,650 plants were alive the following spring, none of them produced sufficient growth in 1939 to warrant a cutting for hay, and none showed any sign of heading.

Further hybridization work has been carried on at the Central Experimental Farm during the intervening years and in 1946 a new triticum-agropyron nursery of forty-five lines was established at the Lacombe Station. It is hoped that some of these lines will show the required hardiness and growth characteristics desired.

FORAGE CROP SEED PRODUCTION TESTS

Seed of timothy, brome, crested wheat grass, creeping red fescue, alfalfa, red, alsike and sweet clover are grown in reasonably large quantities in central Alberta. The Lacombe Station has either introduced or aided in the introduction of improved varieties of these crops including Swallow timothy and Alta-swede red clover from the University of Alberta; Parkland brome, Fairway crested wheat grass and Arctic sweet clover from the University of Saskatchewan; creeping red fescue from the Production Service; and Alpha sweet clover from the Forage Plants Division, Ottawa. In all cases, seed increase blocks were established and maintained until the variety was being grown commercially by seed growers, after which the maintenance of seed stocks was discontinued.

The experience gained by the Station in producing, harvesting, threshing and cleaning the seed from these crops has been of great benefit to those who were producing seed of these crops for the first time.



Fig. 16.—Cutting and windrowing an alsike clover seed crop with a mower and windrowing attachment. Shatter losses are high if the crop is not harvested until fully ripe.

The seed-cleaning plant at the Station, when forage crop seed production was in its infancy, gave support to and was an influential factor in giving decided impetus to forage seed production in the park belt and grey wooded soil area of Alberta. Most of the first registered seed of crested wheat grass, bromo timothy and creeping red fescue grown in the park belt, and the commercial legume seed grown in the grey wooded soil area was cleaned with Station equipment.

Studies are being made at present in connection with the improvement of production, harvesting and threshing methods of red and alsike clover. In the spring of 1947 seed production tests, involving various cultural and fertilizer treatments, were laid down with creeping red fescue, Russian wild rye, alsike and red clover.



Fig. 17.—Threshing alsike clover windrows with a small pick-up combine. A combine equipped with an auxiliary motor is preferred to one operated from a power take-off. It enables a uniform cylinder speed to be maintained regardless of the speed of forward travel.

During the summer of 1946, studies were undertaken in co-operation with the Field Crops Branch, Alberta Department of Agriculture, to determine the magnitude of alsike seed losses occurring from harvesting at different stages of maturity and to determine the optimum stage of maturity for harvesting alsike seed.

Yield and shatter samples were obtained from six farms in the Westlock and Bluffton districts on each of four separate dates: August 10 and 31, September 14 and 30. At each harvesting date a record was kept of the percentage of ripe and brown heads.

Table 32 gives a comparison of seed yields, shatter losses and the stages of maturity of alsike for the different dates of harvesting.

An examination of the data in Table 32 allows the following conclusions to be drawn:

(1) The highest seed yields were obtained, and the lowest shatter losses resulted, when alsike clover was harvested on or before August 31.

TABLE 32.—COMPARISON OF EFFECT OF DATES OF HARVESTING ON SEED YIELDS,
SHATTER LOSSES AND STAGE OF MATURITY OF ALSIKE CLOVER

Date	Average of Six Fields				
	Yield lb. per acre	Shatter Loss lb. per acre	% Ripe Heads	% Brown Heads	% Green Heads
August 10.....	231	114	14	62	24
August 31.....	282	158	31	58	11
September 14.....	153	175	77	21	2
September 30.....	131	281	99	1	0

(2) Similarly, the highest seed yields were obtained and the lowest shatter losses resulted by harvesting alsike clover when approximately 60 per cent of the heads were brown and approximately 30 per cent were ripe.

It is believed that the latter criterion would be the more useful guide to indicate the optimum time for harvesting since the optimum date for harvesting is influenced so much by seasonal conditions.

HORTICULTURE

H. T. Allen

Horticultural work at Lacombe over the ten years under review has consisted of the testing, by means of comparison under similar growing conditions various species, varieties, and strains of trees and shrubs, tree and bush fruits, annual and perennial flowers, and vegetables. The results obtained from these trials make it possible to draw up recommended lists of the plants that are hardy and best adapted to the growing conditions of central Alberta.

DECIDUOUS TREES AND SHRUBS AND EVERGREENS

A wide variety of deciduous trees and shrubs and evergreens can be found growing on the grounds of the Lacombe Experimental Station. Possibly the most versatile of all kinds is the native white spruce, *Picea glauca*, which not only does well in group plantings, and as a specimen and avenue tree, but is one of the best windbreak and hedging plants. Various species and varieties that have proved to be satisfactory under Lacombe conditions, together with the use to which they have been put on the station, are listed below:

TALL GROWING EVERGREENS

Name	Use
<i>Abies balsamea</i> (Balsam Fir).....	Group plantings.
<i>Picea Engelmanni</i> (Engelmann Spruce).....	Group plantings.
<i>Picea glauca</i> (White Spruce).....	Avenue, Group, Hedge Specimen, Windbreak.
<i>Picea pungens</i> (Colorado Spruce).....	Avenue, Group, Specimen.
<i>Pinus Cembra</i> (Swiss Stone Pine).....	Specimen.
<i>Pinus contorta latifolia</i> (Lodgepole Pine).....	Group, Hedge.
<i>Pinus sylvestris</i> (Scotch Pine).....	Group, Specimen.

LOW GROWING EVERGREENS

<i>Juniperus horizontalis</i> (Creeping Juniper).....	Ground cover.
<i>Pinus Mugo</i> (Swiss Mountain Pine)	Group.
<i>Thuja occidentalis Wareana</i> (American Arborvitae).....	Hedge.

DECIDUOUS TREES

<i>Acer Negundo</i> (Manitoba Maple).....	Avenue, Group Specimen Windbreak.
<i>Betula papyrifera</i> (Canoe Birch).....	Group, Specimen.
<i>Betula pendula gracilis</i> (Cutleaf Weeping Birch).....	Specimen.
<i>Fraxinus pennsylvanica</i> var. <i>lanceolata</i> (Green Ash).....	Avenue, Specimen, Windbreak.
<i>Larix sibirica</i> (Siberian Larch).....	Specimen, Windbreak.
<i>Malus baccata</i> (Siberian Crab).....	Group.
<i>Populus Petrowskyana</i> (Russian Poplar).....	Avenue, Windbreak.



Fig. 18.—Entrance to the Station showing a great variety of trees and shrubs.

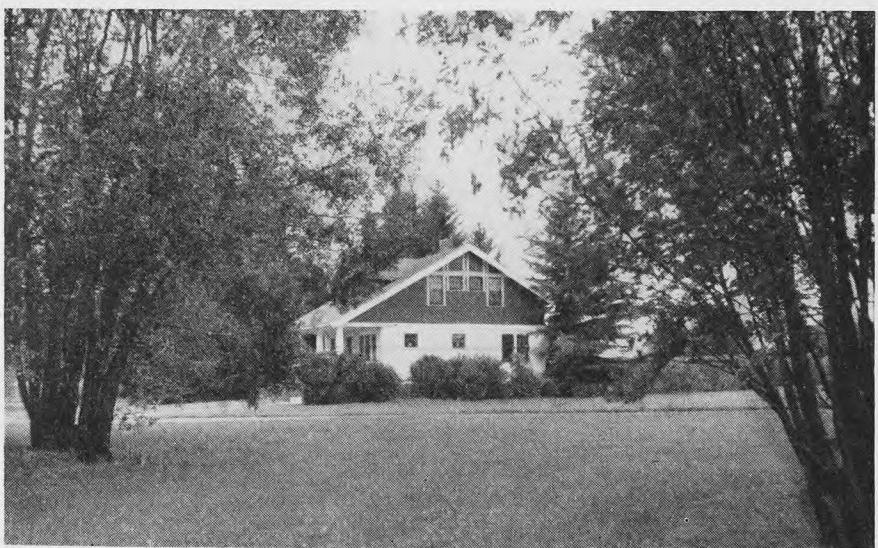


Fig. 19.—Trees and shrubs add much to the beauty of the landscape at the Dominion Experimental Station, Lacombe.

DECIDUOUS TREES—Concluded

Name	Use
Northwest Poplar.....	Avenue, Specimen.
Quercus macrocarpa (Burr Oak).....	Specimen.
Salix pentandra (Laurel Willow).....	Hedge, Windbreak.
Sorbus aucuparia (European Mountain Ash).....	Group, Specimen.
Ulmus americana (American Elm).....	Avenue, Specimen, Windbreak.

SHRUBS OR TREE-LIKE SHRUBS OVER 10 FEET HIGH

Acer ginnala (Amur Maple).....	Group, Hedge.
Amelanchier alnifolia (Saskatoon).....	Group, Hedge.
Crataegus rotundifolia (Roundleaf Hawthorn).....	Group.
Prunus Padus (European Bird Cherry).....	Group, Specimen.
Prunus pennsylvanica (Pin Cherry).....	Group, Windbreak.
Prunus virginiana melanocarpa (Western Chokecherry).....	Group, Windbreak.
Syringa japonica (Japanese Tree Lilac).....	Group.
Syringa villosa (Chinese Lilac).....	Group.
Syringa vulgaris (Common Lilac).....	Group.

SHRUBS 6 TO 10 FEET HIGH

Caragana arborescens (Siberian Pea-tree).....	Hedge, Windbreak.
Elaeagnus argentea (Silver-berry).....	Group.
Lonicera tatarica (Tatarian Honeysuckle).....	Group, Hedge.
Physocarpus opulifolius (Ninebark).....	Group.
Rosa spinosissima (Scotch Rose).....	Group, Hedge.
Sambucus racemosa (European Red Elder).....	Group.
Shepherdia argentea (Buffalo-berry).....	Group, Hedge.
Viburnum trilobum (Highbush Cranberry).....	Group, Fruit.

SHRUBS 4 TO 6 FEET HIGH

Caragana microphylla (Littleleaf Pea-tree).....	Group.
Cornus alba siberica (Siberian Dogwood).....	Group.
Cornus stolonifera (Red Osier Dogwood).....	Group.
Philadelphus var. Purity (Mock Orange).....	Group.
Prunus tomentosa (Nanking Cherry).....	Group, Fruit.
Ribes aureum (Golden Currant).....	Group.
Sambucus canadensis (American Elder).....	Group.
Sorbaria sorbifolia (Ash-leaf Spiraea).....	Group.

SHRUBS 3 TO 4 FEET HIGH

Name	Use
Caragana pygmaea (Pigmy Caragana).....	Group, Hedge.
Cotoneaster acutifolia (Peking Cotoneaster).....	Group, Hedge.
Cotoneaster integerrima (European Cotoneaster).....	Group.
Prinsepia sinensis (Cherry Prinsepia).....	Group.
Rosa rugosa hybrids (Rugosa Rose).....	Group.
Spiraea media (Oriental Spirea).....	Group.
Spiraea pikoviensis (Pikov Spirea).....	Group.
Spiraea trichocarpa (Korean Spirea).....	Group.

SHRUBS 1 TO 3 FEET HIGH

Potentilla fruticosa (Shrubby Cinquefoil).....	Group.
Prunus glandulosa (Flowering Almond).....	Group.
Spiraea Bumalda Froebeli (Froebel Spirea).....	Group.

BEST PLANTS FOR HIGH HEDGES

Caragana arborescens (Siberian Pea-tree).	
Lonicera tatarica (Tatarian Honeysuckle).	
Picea glauca (White Spruce).	
Pinus contorta latifolia (Lodgepole Pine).	
Salix pentandra (Laurel Willow).	
Syringa amurensis (Amur Lilac).	
Syringa Josikaea (Hungarian Lilac).	



Fig. 20.—Experimental Hedges with Arboretum in Background.

- Caragana pygmaea* (Pigmy Caragana).
Cotoneaster acutifolia (Peking Cotoneaster).
Rosa spinosissima (Scotch Rose).
Shepherdia argentea (Silver Buffaloberry).
Thuja occidentalis Wareana (American Arborvitae).

TREE FRUITS

A few varieties of apples, crabapples, and apple-crabapple hybrids have proved to be hardy and good producers of edible fruit. However, under similar well sheltered conditions no variety of plum has been hardy or early enough to be satisfactory.

Apples—Hibernal, Manan, Manred.

Crabapples—Anaros, Columbia, Dolgo, Garnet, Olga, Osman.

Apple-Crabapple Hybrids—Rosilda, Trail.

Sandcherry-Plum Hybrids—Ezaptan, Opata, Tom Thumb.

Sandcherries—Manmoor, Sioux.

SMALL FRUITS

Central Alberta conditions are ideal for the production of good quality fruit from raspberries, currants, gooseberries and strawberries, but the generally recommended practices of mulching strawberries and tip-burying raspberries must be followed to prevent winter injury to these crops.

Raspberries—Chief, Herbert, Viking.

Currants—Black—Black Naples, Climax, Collins, Saunders, Topsy.

Red—Holland, Pomona, Stevens No. 9.

White—Large White, White Cherry, White Grape.

Gooseberries—Abundance, Pixwell, Sylvia.

Strawberries—June Bearing—Dunlop.

Everbearing—Gem.



Fig. 21.—An attractive Vista and Perennial Border with Perennial Phlox in full bloom.

PERENNIAL FLOWERS

Borders of perennial flowers with their diversity of colour, foliage, and habit of growth, are a source of satisfaction unequalled by other forms of gardening. Such borders at Lacombe, exposed to the south, and protected from prevailing winds by a background of hedges or shrubbery, contain a wide range of species and varieties that give colour to the border from the time the snow is off the ground in the spring, until the first killing frost in the fall.

Some of the better perennial flowers, together with flower colour and approximate time of blooming and height, are listed below:

Name	Season	Approx. height (in.)	Flower colour
Achillea Ptarmica var. The Pearl (Sneezewort).....	July	22	White.
Aconitum Napellus var. bicolor (Aconite Monkshood).....	Aug.	36	Blue, white.
Aquilegia longissima (Longspur Columbine).....	June	24	Yellow.
Boltonia asteroides (White Boltonia).....	Aug.	36	Cream.
Caltha palustris (Marsh Marigold).....	May	14	Yellow.
Campanula carpatica (Carpathian Bellflower).....	June	12	Blue, white.
Chrysanthemum maximum (Shasta Daisy).....	July	20	White.
Convallaria majalis (Lily-of-the-Valley).....	May	10	White.
Delphinium hybrids (Delphinium).....	July	60	Various.
Dianthus plumarius (Grass Pink).....	June	9	Various.
Dicentra spectabilis (Bleeding-Heart).....	May	36	Pink.
Dictamnus albus (Gas-Plant).....	June	36	Whitish.
Digitalis ambigua (Yellow Foxglove).....	June	17	Yellow.
Gypsophila paniculata (Baby-Breath).....	July	30	White.
Heliopsis scabra (Rough Heliopsis).....	July	36	Orange.
Hemerocallis flava (Lemon Daylily).....	July	24	Yellow.
Hemerocallis Middendorffii (Middendorff's Daylily).....	June	20	Orange.
Iberis sempervirens (Perennial Candytuft).....	May	9	White.
Iris germanica in variety (German Iris).....	June	18	Various.
Lilium canadense (Canada Lily).....	July	36	Reddish orange.
Lilium elegans (Thunberg Lily).....	June	30	Reddish orange.
Lilium tigrinum (Tiger Lily).....	Aug.	36	Reddish orange
Linum perenne (Perennial Flax).....	May	18	Blue.
Lupinus polyphyllus—Russell var. (Perennial Lupine).....	June	24	Various.
Lychnis chalcedonia (Maltese Cross).....	July	24	Scarlet.
Lychnis Viscaria dbl. (Clammy Campion).....	June	15	Rosy-purple.
Lythrum Salicaria (Purple Loosestrife).....	June	36	Rose purple.
Paeonia varieties (Peony).....	July	36	Various.
Papaver nudicaule (Iceland Poppy).....	June	12	Yellow, orange, white.

Name	Season	Approx. height (in.)	Flower colour
Phlox paniculata (Perennial Phlox).....	July	32	Various.
Ranunculus acris flore-pleno (Tall Buttercup).....	May	24	Gold.
Rudbeckia laciniata var. hortensia (Golden Glow).....	Aug.	60	Orange.
Trollius europaeus (Common Globeflower).....	June	22	Yellow.

Perennial flowers that have a low growing habit and are thus well suited for both rockeries and as fillers in the front of the larger border are listed below.

Name	Season	Flower colour
Ajuga reptans (Carpet Bugle—Weed).....	May	Purple.
Allium angulosum (Angle Onion).....	July	Purple.
Alyssum saxatile (Gold-Dust).....	May	Yellow.
Androsace villosa (Rockjasmine).....	May	Red and white.
Anemone pulsatilla (European Pasqueflower).....	April	Purple.
Arabis alpina (Alpine Rockcress).....	April	White.
Aubrieta hybrid. (Aubrieta).....	May	Purplish.
Cerastium tomentosum (Snow-in-Summer).....	June	White.
Dianthus deltoides (Maiden Pink)	June	Rose.
Draba alpina (Rockeress Draba).....	May	Yellow.
Gypsophila repens (Creeping Gypsophila).....	June	Pink.
Iris pumila (Dwarf Iris).....	May	Various.
Lychnis Viscaria (Clay Campion).....	June	Magenta.
Myosotis scorpioides (True Forget-Me-Not).....	June	Blue.
Phlox subulata (Moss-Pink).....	June	Rose purple.
Primula Auricula (Auricula Primrose).....	June	Various.
Primula cortusoides (Bigleaf Primrose).....	June	Red, purple.
Primula veris (Cowslip Primrose).....	June	Yellow.
Saxifraga aizoon (Aizoon Saxifrage).....	June	Cream.
Sedum acre (Goldmoss Sedum).....	June	Yellow.
Sedum spectabile (Showy Stonecrop).....	July	Rose.
Sempervivum tectorum (Hen and Chickens).....	Aug.	Purple.
Thymus Serpyllum (Mother of Thyme).....	June	Violet.
Veronica incana (Woolly Speedwell).....	July	Purplish.
Veronica repens (Creeping Speedwell).....	May	Blue.

ANNUAL FLOWERS

Annual flowers afford the gardener a chance to exert his artistic abilities for by the skillful blending of colour and form, attractive designs can be made for the bed or border. Annual flowers are an inexpensive means for adding colour to what might otherwise be drabiness as against the bare walls of buildings and fences. They can also be used to advantage for window boxes and to fill spaces in foundation plantings, openings in shrubbery, and bare spots in the perennial border.

Following is a table of half-hardy annuals together with flower colour and approximate height. These plants should be started indoors in early spring and planted in their permanent location when all danger of frost is over.

Name	Approx. height (in.)	Flower colour
Ageratum Houstonianum (Floss-Flower).....	7	Blue, white.
Antirrhinum majus (Snapdragon).....	10-36	Various.
Callistephus chinensis (China Aster).....	18	Various.
Celosia argentea var. cristata (Cockscomb).....	12	Crimson.
Cosmos bipinnatus (Cosmos).....	36	Crimson to white.
Dahlia-Coltness Hybrids (Seed Dahlia).....	24	Various.
Datura fastuosa (Angels Trumpet).....	24	White.
Dianthus chinensis var. Hedgewigii (China Pink).....	12	Various.
Dimorphotheca aurantiaca (Cape-Marigold).....	12	Orange to white.
Helichrysum bracteatum (Strawflower).....	24-36	Red, pink, yellow, white
Lobelia Erinus (Edging Lobelia).....	7	Blue, purple, white.
Mathiola incana var. annua (Ten Week Stocks).....	18	Various.
Nemesia strumosa (Nemesia).....	12	Various.
Nicotiana alata var. grandiflora (Tobacco).....	36	White.
Nierembergia caerulea (Cup-Flower).....	6	Blue.
Petunia hybrida (Petunia).....	12	Various.
Phlox Drummondi (Annual Phlox).....	12	Various.
Salpiglossis sinuata (Salpiglossis).....	24	Various.
Salvia splendens (Scarlet Sage).....	20	Scarlet.
Schizanthus pinnatus (Butterfly-flower).....	20	Various.
Tagetes erecta (African Marigold).....	30	Orange, to lemon.
Tagetes patula (French Marigold).....	12	Maroon, gold, yellow.
Verbena hybrida (Verbena).....	12	Various.
Viola tricolour (Pansy).....	10	Various.
Zinnia elegans (Zinnia).....	24	Various.

The following table lists the more common hardy annuals together with flower colour and approximate height. In the early spring seeds of these plants should be sown in beds or borders where they are meant to bloom.

Name	Approx. height (in.)	Flower colour
Brachycome iberidifolia (Swan River Daisy).....	12	Various.
Calendula officinalis (Pot Marigold).....	20	Yellow.
Centaurea Cyanus (Cornflower).....	24	Blue, pink, white.
Chrysanthemum carinatum (Annual Chrysanthemum).....	24	White to crimson.
Clarkia elegans (Rose Clarkia).....	24	Red to whit
Coreopsis tinctoria (Calliopsis)	24	Yellowish.
Delphinium Ajacis (Rocket Larkspur).....	30	White to blu
Eschscholtzia californica (California-Poppy).....	12	Yellow, pi red.
Godetia amoena (Farewell-to Spring).....	20	White to crimson.
Gypsophila elegans (Annual Baby's-Breath).....	15	White.
Iberis amara (Candytuft).....	12	White.
Kochia scoparia var. Trichophila (Summer Cypress).....	24	Foliage plan
Lathyrus odoratus (Sweet Pea).....	48	Various
Lavatera trimestris (Annual Lavatera).....	30	Pink.
Linaria maroccana (Toadflax).....	12	Various.
Lobularia maritima (Sweet Alyssum).....	6	White.
Mentzelia Lindleyi (Blazing Star).....	18	Yellow.
Nigella damascena (Love-in-a-Mist).....	15	Blue.
Papaver Rhoeas (Corn Poppy).....	20	Various.
Portulaca grandiflora (Rose-Moss).....	7	Various.
Reseda odorata (Mignonette).....	20	Brownish.
Scabiosa atropurpurca (Sweet Scabious)	30	Various.
Tropaeolum majus (Nasturtium)	12	Yellow to scarlet.

VEGETABLES

Most vegetable crops do well at Lacombe but the seasons are too cool short and variable for the production of egg plant, okra, pop corn, soybeans and watermelon. Corn and tomatoes are frequently damaged by early frosts before mature fruit has been harvested from any except the earliest varieties.

Asparagus: Mary Washington, Martha Washington.

Beans: Broad—Broad Windsor, Long Pod Seville.

Bush, Green Flat—Bountiful.

Green Round—Masterpiece, Stringless Green Pod.

Yellow Flat—Currie's Rust Proof, Pacer.

Yellow Round—Improved Golden Wax.

Pole—Blue Lake, Scarlet Runner.

Beets—Crimson Globe, Detroit Dark Red, Early Flat Egyptian.

Broccoli—Italian Green Sprouting.

Brussels Sprouts—Dalkeith, Long Island Improved.

Cabbage—Early—Copenhagen Market, Golden Acre.

Midseason—Glory of Enkhuizen.

Late—Danish Ballhead, Danish Roundhead.

Late—Danish Red Stonehead.

Carrot—Imperator, Nantes, Oxheart, Red Cored Chantenay.

Cauliflower—Erfurt, Snowball, Snowdrift, Snow Queen.

Celery—Golden Supreme, Salt Lake or Utah.

Citron—Green Seeded Preserving, Red Seeded Preserving.

Corn—Banting, Dorinny, Golden Gem, Picaninny.

Cucumber—Pickling—Early Russian.

Slicing—Davis Perfect, Early Arlington White Spine, Early Fortune, Straight 8, Taxpayer, Vaughans.

Endive—Full Hearted Improved, Moss Curled.

Herbs—Dill, Rosemary, Sage, Savory, Sweet Basil, Sweet Marjoram, Thyme.

Kohlrabi—Early Purple Vienna, Early White Vienna.

Leek—Musselborough.

Lettuce—Butterhead, Big Boston.

Crisphead—Iceberg, New York No. 12.

Leaf—Grand Rapids.

Muskmelon—Farnorth (some seasons).

Onions—Ailsa Craig, Cranstons Excelsior, Ebenezer, Prizetaker, Red Wethersfield, Southport Yellow Globe, Sweet Spanish, Yellow Globe Danvers.

Parsley—Mossy Curled

Parsnips—Guernsey, Hollow Crown, Short Thick.

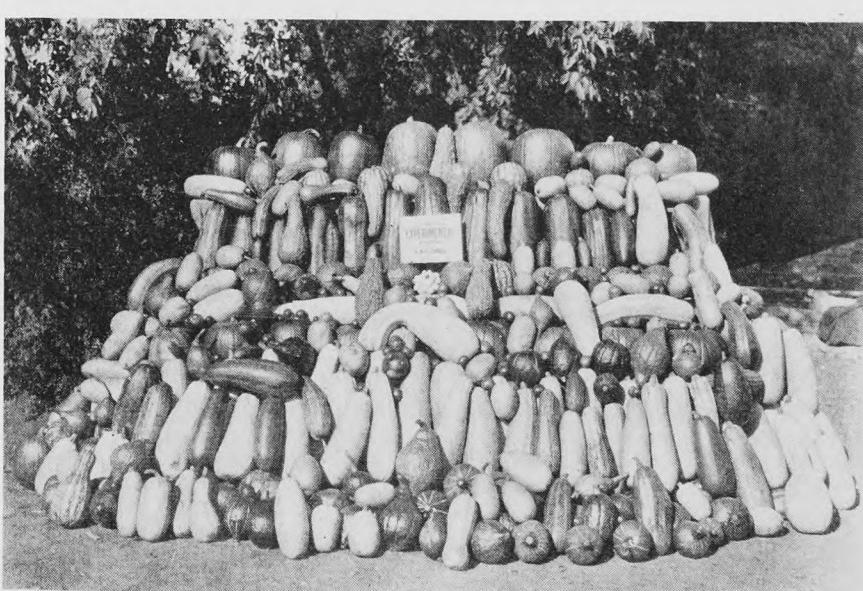


Fig. 22.—Most Vine Crops do well at Lacombe.

- Peas*—Early—American Wonder, Laxton's Progress, Little Marvel.
 Midseason—Director, Engton, Laxall, Laxtonian, Lincoln, Lin Tomish.
 Late—Onward, Stratagem.
- Pepper*—(Most seasons) Harris Earliest, Fordhook, Windsor A.
- Potato*—Early—Warba.
 Midseason—Irish Cobbler.
 Late—Netted Gem.
- Pumpkin*—(Some seasons) Small Sugar, Winter Luxury.
- Radish*—Most Varieties.
- Rhubarb*—Canada Red, Early Sunrise, Macdonald.
- Rutabaga*—Bangholm, Canadian Gem, Laurentian.
- Salsify*—Scorzonera.
- Spinach*—Bloomsdale, King of Denmark, Princess Julian.
- Squash*—Buttercup, Golden Hubbard, Green Hubbard, Kitchenette.
- Swiss Chard*—Lucullus.
- Tomato*—Non-staking—Bounty, Early Chatham, Farthest North, Redye
 Staking—Abel, Earliana.
- Vegetable Marrow*—Cocozelle, Zucchini.

POULTRY

H. T. Fredeen

The flock at the Lacombe Station consists of about 400 mature White Wyandotte females and 150 New Hampshire pullets. The number of White Wyandottes has remained fairly constant throughout the ten years under review while the New Hampshires were added to the flock in 1946. They are being used in projects designed to compare the two breeds and their reciprocal crosses for fertility, hatchability, growth rate, egg production and mortality.

BREEDING

At this Station, progeny testing has been an active project for the ten years covered by this report, the object being to improve the strain of White Wyandottes. As a result, there has been a slight annual increase in average egg weight, although egg production averages have remained fairly constant. For the ten-year period, egg production has averaged 210.2 eggs per year, egg weight has averaged 24.8 ounces per dozen and mortality has averaged 15.4 per cent. It must be noted here that mortality is subject to violent yearly fluctuations because of disease epidemics in certain years. Thus, mortality varied from a high of 32.9 per cent in 1941 to a low of 1.7 per cent in 1944.

FAST FEATHERING

On the basis of rate of feathering, White Wyandottes may be divided into two groups, those that are slow feathering and show well developed wing and tail feathers only after four weeks of age and those that are fast feathering with well developed feathers at two weeks. This difference is important economically, especially in the production of broilers.

In the spring of 1939, all chicks hatched at the Lacombe Station were classified at fourteen days of age as to rate of feathering with the object of developing the fast feathering factor in the Lacombe strain of White Wyandottes.

To attain a fast feathering strain in the shortest possible time, three general principles were followed in the selection of breeding stock:

1. All fast feathering chicks are pure for this characteristic and therefore future breeders were selected from this class.
2. Male birds which produced all fast feathering female chicks were retained as breeders.
3. Females which produced fifty per cent or more fast feathering cockerels were kept for breeding stock.

Results from this selection were such that in six years the entire flock was pure for fast feathering and since 1945 only birds of this strain have been sold as breeding stock.

SALE OF BREEDING STOCK AND HATCHING EGGS

During the ten years under review a total of 968 females, 864 cockerels and 35,389 hatching eggs have been sold to farmers and poultry raisers mostly in the Western Provinces. In this area the Lacombe flock of Wyandottes is the outstanding source of pedigreed breeding stock for this breed of poultry.

BLOOD TEST FOR BACILLUS PULLORUM

Blood testing for Pullorum disease has been a routine practice for the last ten years. Since 1942 there have been no reactors to the test.

HATCHING RESULTS

It is an accepted fact among poultrymen that the fertility and hatchability of the White Wyandotte is lower than for any of the popular breeds of poultry. This has been repeatedly confirmed by comparing the results obtained at Dominion Experimental Farms and Stations across Canada where other breeds are maintained with those obtained by White Wyandottes at this Station.

The average hatching results obtained with the Lacombe flock during the ten years under review are presented in the following table:—

TABLE 33.—HATCHING SUMMARY FOR THE TEN-YEAR PERIOD, 1937-1946 INCLUSIVE

Total eggs set	% Fertile eggs	No. of chicks hatched	Percentage total eggs hatched	Percentage fertile eggs hatched
16,062.....	82.9	8,008	49.9	60.1

THE EFFECTS OF VITAMINS ON FERTILITY AND HATCHABILITY

In the 1940 breeding season, a test was conducted to determine if doubling the usual ration of cod liver oil recommended for a breeding ration would have any beneficial results on fertility and hatchability. The results of the experiment showed that the total number of eggs required to hatch 100 chicks from the pens receiving the higher percentage of cod liver oil was 175 while from the other group it was necessary to set 214 eggs to obtain the same number of chicks.

To check these results, similar tests were carried out in three subsequent years but the differences in hatchability obtained for the two groups were so small as to be considered non-significant. It was, therefore, concluded that the amount of cod liver oil recommended for breeding rations was ample for optimum fertility of the eggs.

Another test was conducted to investigate the value of Vitamin G in the breeding ration but results obtained demonstrated no beneficial results from its inclusion.

TESTING OF FRESH EGGS FOR HATCHABILITY BY SPECIFIC GRAVITY

Salt solutions of various concentrations were used for the determination of specific gravity and all eggs were tested on the date they were laid. The average specific gravity obtained for the 1222 eggs tested was 1.083. The hatchability of eggs with specific gravity less than 1.078, considered the critical level, was 41.67 and for eggs with specific gravity greater than 1.078 hatchability was 55.51 per cent. These data, when combined with similar data from other Experimental Stations, demonstrated a direct relationship between specific gravity and hatchability.

THE EFFECT OF FEEDING PROTAMONE ON HATCHABILITY

In 1946, work was conducted to determine what influence might be had on the hatchability of White Wyandotte and New Hampshire hatching eggs by feeding of protamone, an iodinated casein product, to the laying hens. Results obtained appear in Table 34.

In comparing the two groups of birds no significant difference in hatchability was demonstrated. However, the shell texture of the eggs was improved by the feeding of protamone and specific gravity of the eggs was increased by 0.004.

TABLE 34.—RESULTS OF FEEDING PROTAMONE ON HATCHABILITY

Breed	Treatment	No. of eggs tested	Average specific gravity	Percentage fertile eggs hatched
White Wyandotte.....	Protamone.....	1,013	1.085	41.5
New Hampshire.....	Protamone.....	373	1.089	58.7
White Wyandotte.....	Control.....	1,038	1.082	48.8
New Hampshire.....	Control.....	341	1.086	52.8

HOUSING EXPERIMENT

The object of this experiment was to compare the results obtained from pullets housed in the regulation straw loft type of poultry house with those obtained from birds in an insulated house with controlled ventilation (Sanctuary system). The test was commenced on November 1, 1939, and concluded on March 20, 1940. Records were kept of feed consumption, egg production and the daily minimum and maximum temperatures within each pen.

TABLE 35.—HOUSING EXPERIMENT NOVEMBER 1, 1939, TO MARCH 20, 1940

Type of ventilation	Pen No.	No. of Bird days	Total egg Production	Percentage egg production	Average temperature	
					Min.	Max.
Controlled.....	1	7,050	4,639	65.7	36.9	42.0
Straw Loft.....	2	6,993	3,894	55.7	29.9	38.8

These results show that the egg production of the birds housed in an insulated pen with controlled ventilation was 10 per cent higher than from pullets housed in a pen where the straw loft type of ventilation was used. Minimum and maximum temperatures in the former pen were also maintained at higher levels. It is of interest to note that the average outside temperatures for the 141-day period were 12.3 degrees minimum and 33.7 degrees maximum. The difference in total feed consumed between the two pens was negligible though in favour of the warmer pen. This is understandable since these birds would require less feed to maintain optimum body temperature.

THE EFFECT OF ENVIRONMENT ON HATCHABILITY

An experiment was conducted to test the relative influence of genetic and environmental difference on hatchability within the White Wyandotte breed. For this purpose, a reciprocal transfer of 28 White Wyandotte pullets was made between this Station and that at Summerland, B.C., where hatchability results with the breed had consistently been much above the results obtained at Lacombe.

Summerland pullets at Lacombe were housed with Lacombe pullets and mated with Lacombe males. Similarly, the Lacombe pullets at Summerland were housed with Summerland pullets and mated with Summerland males.

Results obtained at both Summerland and Lacombe proved fairly conclusively that there was no inherited difference between the two strains so far as hatchability was concerned. However, there was distinct evidence of an environmental difference between the two Stations and further work has been planned to demonstrate the nature of this difference.

**ILLUSTRATION STATIONS
and
DISTRICT EXPERIMENT SUBSTATIONS**

A. W. Wilton and A. R. Aitken

On the Illustration Stations and District Experimental Substations, problems are studied in their local environment representing an extension of the comprehensive work carried on at the Experimental Farms and Station. A District Experimental Substations are operated on privately-owned farms under the basis of a co-operative agreement entered into between the owner and the Dominion Experimental Farms Service. In Alberta, the present organization comprises 27 Illustration Stations and District Experimental Substations serving the outlying areas surrounding the Dominion Experimental Stations at Lethbridge, Lacombe, and further north at Beaverlodge in the Peace River District. The work conducted on Illustration Stations and District Experimental Substations has been consistently broadened in scope and has progressed from the original purpose of disseminating experimental information by field and cultural demonstration to include crop testing and experiments of a fact-finding nature.

The production of adapted varieties of cereals and forage crops, which are adaptable, is promoted on Illustration Stations and District Experimental Substations in order that these farms may serve as sources of pure seed for farmers in surrounding districts. Strip farming, soil erosion control and the introduction of improved cultural practices are important phases of the work on Stations. Farms in Alberta. Livestock policies which are designed to promote the development of improved herds of cattle and swine as well as flocks of sheep and poultry, from which neighbouring farmers may procure breeding stock are an integral part of Illustration Station and District Experiment Substation activities. Farm management studies as well as farm home beautification are other projects designed to acquire information on the most economical methods of production and promote those features which contribute to financial effectiveness and all those which enhance the comfort and attractiveness of farm living.

The six Illustration Stations and three District Experimental Substations which comprise the district supervised from Lacombe are located in the north central part of the province with the southern extremity lying approximately at a line from Consort in the east through Hanna, Drumheller, and Calgary in the west central portion. The present northern limit where work is underway is at Athabasca where a special grey wooded soils experiment station was established in 1946. The great variety of soils and climate peculiar to the individual stations permits investigation of agricultural practices under a wide range of conditions. Some of the more important fields of work being given

TABLE 36.—LOCATION OF STATIONS AND NAMES OF OPERATORS

Illustration Stations—

Athabasca	J. Eherer
Chauvin	E. A. Pitman
Chedderville	Howard Williams
Dickson	J. A. Sandberg
Fallis	W. H. Margerison
Leslieville	G. N. Lynn
St. Paul	J. R. LaFrance

District Experiment Substations—

Castor	C. F. Pals
Metiskow	Ed. Masson
Red Deer	F. W. Chisholm and H. P. Hartrick

tention are the control of wind erosion in the more arid sections, the use of fertilizers and cropping practices on grey wooded soils; also crop rotations and soil management and control of weeds and insect pests. Throughout this report, reference will be made to certain districts, and, where this is done, it will relate the work carried out previously with the Station operators at Consort, Langdon and Winfield and which is being developed at present in co-operation with the farmers listed in Table 36 as operators of Illustration Stations and District Experiment Substations.

PASTURE INVESTIGATIONAL STUDIES

A twelve-acre field on the Falls Illustration Station located on typical grey wooded soil was seeded to a comparative test of legume and grass mixtures for pasture in June, 1943. White Dutch clover, alsike and alfalfa were seeded alternatingly in three strips. These legumes were seeded at the rate of 2.5, 4.0 and 6.5 pounds per acre, respectively. The grasses, which included crested wheat grass, creeping red fescue, Kentucky blue, red top, meadow fescue, brome and timothy, were seeded in strips across the legumes, forming a checkerboard arrangement of twenty-one mixtures. All grasses were seeded at approximately three pounds per acre. Duplicate plots of pure stands of each legume were left, making a total of 27 plots. The field was pastured during 1944, 1945 and 1946. Square yard pasture cages were used to determine the yield of each mixture. Yields were computed to a standard 12 per cent moisture content.

White Dutch clover, singly, and in combination with all species of grasses, produced an average total yield of 5.02 tons of hay for the three-year period. The nine comparable plots containing alsike clover produced an average of 4.45 tons for the same period, and the plots seeded with alfalfa yielded an average of 5.78 tons. Of the grasses in combination with these three legumes, timothy produced the highest total average yield for the three years with 6.37 tons of hay per acre. Brome, meadow fescue, Kentucky blue, red top and creeping red fescue followed in descending order. Crested wheat grass was the least productive, having an aggregate of 5.16 tons.

While the alsike plots substantially outyielded both the white dutch and alfalfa plots, it was observed that livestock had a marked preference for mix-



FIG. 23—Field day scene at Castor, Alta. A farm machinery demonstration is taking place.

tures containing the latter species. From the standpoint of palatability, a combination with each of brome grass, timothy and crested wheat white Dutch alone and in combination with each of brome, creeping red fescue and crested wheat grass were preferred. Alsike with creeping red fescue and crested wheat grass was acceptable. Red top and meadow fescue were favoured.

SOIL FERTILITY

Much attention has been directed toward determining the fertilizer requirements of grey wooded soils in central Alberta inasmuch as any great expansion in the acreage of cropped land must of necessity take place on the wooded soils. A project investigating plant food deficiency in grey wooded soils has been conducted on the Illustration Stations at Chedderville, Fallis, Sangudo and Winfield. During the past nine years of the period under review comparable yield data have been obtained from thirteen fields of wheat, and six crops each of barley and legume hay produced on these farms. Deficient plant elements are determined by measuring crop response and long-term trends to the application of commercial fertilizers, singly and in combination; treatment with farmyard manure; and the inclusion of legumes in the cropping system. Two three-year crop rotations are followed: one is a standard grain rotation of fallow, grain and grain; the other fallow, grain seeded down, and legume hay. Fertilizers are applied in the first year grain and the residual effect obtained in the second grain and hay crop.

An average yield of wheat taken from thirteen tests for the period 1938 to 1946 gave increased yields of 8.5 bushels as a result of an application of 80 pounds ammonium sulphate; 11.0 bushels from 100 pounds of ammonium phosphate (16-20); and 12.0 bushels from farmyard manure applied at the rate of 15 tons per acre. The average yield of the check plots of wheat was 28 bushels per acre. Barley also gave increased yields over the check plots of four, five and eight bushels per acre as a result of the same respective fertilizer and farmyard manure applications. The average yield of the check plots of barley was 35 bushels per acre. The residual effect of each of the treatments, ammonium sulphate, ammonium phosphate (16-20) and farmyard manure alone gave increased yield of 0.75 tons hay. Of interest, too, is the fact that the residual effect of an application of ammonium phosphate (16-20) at 100 pounds in combination with potassium sulphate at 40 pounds and sulphur at 20 pounds per acre gave an increased yield of 1.12 tons of hay per acre, indicating that the complete fertilizer has given the highest average yield of hay in these tests.

A summary of the experiments carried out to date indicates that grey wooded soils respond well to the addition of organic matter through the growing of legumes in the crop rotation and the use of farmyard manure. Commercial fertilizer response is largely dependent on a fair moisture supply; those fertilizers containing nitrogen, phosphorus and sulphur in combination give the greatest increased yields, whereas when these are applied singly the yield is not increased appreciably.

This project was revised in 1944 and has since been established on Chedderville and Athabasca stations according to specified fertilizer treatments for cereal and legume crops.

ROTATION STUDIES

Seven different rotations are under study on the stations supervised at Lacombe. Systematic cropping programs are established on each station with the object of stabilizing production from year to year, improving soil fertility and controlling weeds. Rotation fields are laid out to minimize fencing and allow for greater economy of field operations. Each rotation is designed to fit the type of farming carried on at each station.



FIG. 24—Mixture of Altaswede clover and timothy on grey wooded soil at Chedderville, Alta. No fertilizer used at left of picture; at right: A.P. (16-20) applied at 80 pounds per acre.

FIG. 25—Altaswede clover hay—with and without commercial fertilizer on grey wooded soil at Winfield, Alta. (July 14/44).

A five-year rotation of three years in coarse grains and two years in is proving to be suitable to the general type of farming conducted on g wooded soils in the Fallis area. It provides sufficient forage for the cattle horses, and supplies a good portion of the feed grains for hog production.

TABLE 37.—SUMMARY OF HAY AND GRAIN YIELDS IN A FIVE-YEAR ROTATION AT FALLIS, ALTA.

Year in Rotation	Crop grown	Fertilizer treatment	No. of years grown	Aver. yield
1st year.....	Oats.....	A.P. 16-20 @ 50 lb.	5	68.0 bu
2nd year.....	Oats.....	Amm. Sulph. @ 50 lb.	3	29.6 bu
3rd year.....	Barley seeded.....	Amm. Sulph. @ 50 lb.	5	25.1 bu
4th year.....	Hay {Alfalfa..... Timothy..... Alsike.....}	Amm. Sulph. @ 35 lb.	4	2.63 to
5th year.....	Hay and break.....	Amm. Sulph. @ 35 lb.	3	2.17 to

first-year hay is sometimes left for a cash crop of clover seed. Cereal yields have not been outstanding, but hay yields have been quite satisfactory. Each crop in the rotation receives a boost from an application of commercial fertilizer. There is no serious weed problem. By breaking the sod immediately after a hay crop is taken off, a good partial summerfallow can be obtained.

CEREAL VARIETY TESTING, INTRODUCTION OF NEW VARIETIES AND SALE OF SEED

A series of rod-row cereal variety tests including wheat, oats, barley and rye is conducted on each of the Illustration Stations and District Experiment stations in co-operation with the Cereal Division. These tests in 1946 consist of six varieties of wheat, seven of barley, seven of oats and three of flax seed in four replicates and randomized. Early and late varieties are compared as the newer varieties are tested on soils varying in type. The primary purpose is to ascertain the adaptation of certain new varieties and strains in comparison with those being commonly used. Superior varieties are grown, multiplied and offered for sale by station operators to neighbouring farmers at nominal prices. The distribution of seed grain by station operators in the Lacombe supervisory district during the period 1939 to 1946 amounted to 30,145 bushels of cereals of which 53 per cent was barley, 24 wheat, 22 oats and 1 per cent field peas. The varieties distributed were Marquis and Thatcher wheat by the operators at Castor, Consort, Chauvin and Metiskow; Newal and Olli barley by the operators at Castor, Chauvin, Dickson, Leslieville, Sangudo and St. Paul; Victory and Larain oats by the operators at Castor, Chauvin, Fallis and Leslieville and field peas by the operator at Winfield.

FORAGE CROPS

METHODS OF SEEDING GRASS AND LEGUME HAYS

The procedure followed in seeding down forage crops varies between districts. Emphasis is placed first on preparing a satisfactory seed-bed, which consists of cultivation and packing prior to seeding. Secondly, shallow seeding of the forage crop seed has proved to be very important; seeding should not in any case

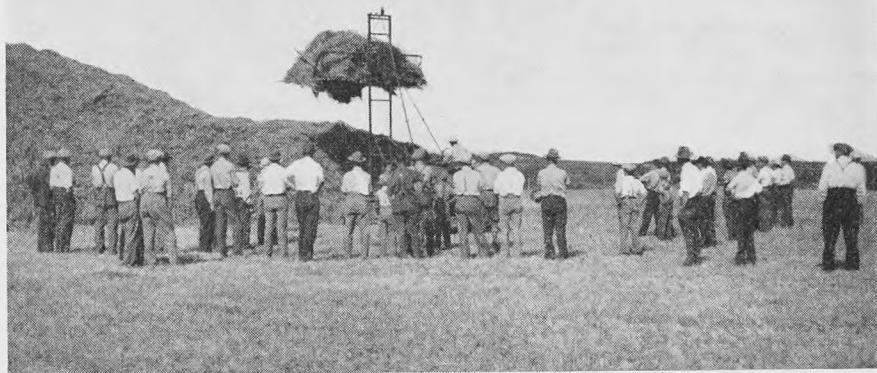


FIG. 26—Sweep-stacker demonstration, Chauvin, Alta., July, 1947.

deeper than one and one-half inches. A grass seeder attachment on the grain drill has proved very satisfactory for seeding small seeded crops such as alfalfa, altaswede, alsike, timothy and some cases, crested wheat grass. Brome grass is sown directly through the grain drill mixed with the nurse crop or mixed with a filler such as cracked wheat, if no nurse crop is used. Practically all the forage crops grown on the stations in the Lacombe supervisory district are seeded through a grass seeder attachment, fertilizer attachment or with a hand cyclone seeder. There are two exceptions however, namely, at Chauvin where moisture is usually limited, most satisfactory catches result when cross seeding of the forage seed is done directly through the drill after the nurse crop is sown; also at the Metiskow Substation, where the soil is extremely sandy and subject to soil drifting, the legume and grass mixtures have been seeded successfully early in April into the stubble. Mixtures of grasses and legumes have proved superior to single species in regard to yield, hay quality and soil improvement. A mixture of alfalfa, brome and crested wheat grass is used at the Castor, Chauvin and Metiskow Stations and is seeded in a mixture of 3, 7 and 2 pounds per acre, respectively. At St. Paul, a mixture of brome grass and alfalfa seeded at 8 and 4 pounds per acre, respectively, is favoured. On the grey wooded stations, mixtures of alsike clover and timothy or alfalfa and timothy or a combination of alfalfa, alsike and timothy have been satisfactory.

SEED PRODUCTION

The method of harvesting legume seed on Illustration Stations has been by the simple practice of mowing the crop, raking it into a windrow and either stacking it in readiness for threshing or threshing it out of the windrow. Several of the Illustration Station operators have produced legume seed in a limited way. During the past eight years, a total of 45,112 pounds of forage crop seed was produced, the great part of which was sold to seed companies from where it was distributed. Sweet clover was produced by the operators at Chauvin and St. Paul; alfalfa at Metiskow alsike and timothy at Chedderville, Fallis and Leslieville; Altaswede red clover and white Dutch clover at Winfield.

HORTICULTURE

THE FARM VEGETABLE GARDEN

The beautification of the home and the production of a good vegetable garden is of utmost importance on every farm. Gardens on the Illustration Stations are planned to provide useful information relative to the choice varieties, the various kinds of vegetables which should be included in farm gardens and the best practical garden layout. The production of early-maturing varieties of vegetables on the majority of the stations on grey wooded soils Zone 4 is of importance because of the existence of a comparatively short frost-free period. Corn, tomatoes and the vine crops are seldom successfully grown in the west central portion of the supervisory district. Among the more common classes of vegetables, the following varieties have proved themselves satisfactory for the period of this report as to quality and productivity:

Beets—Improved Detroit; *Beans*—Pencil Pod, Black Wax; *Peas*—Thomas Laxton, Lincoln, Strategem; *Corn*—Dorinny, Spancross; *Carrots*—Nantes Ha Long, Chantenay; *Swiss Chard*—Lucullus; *Onion*—Yellow Globe, Danvers No. Red Wethersfield; *Cabbage*—Copenhagen Market, Danish Ballhead; *Lettuce* New York No. 12 and Grand Rapids; *Cucumber*—Straight 8 and Early Fortune; *Radish*—Scarlet Turnip White Tip; *Tomatoes*—Early Chatham, Bound Earliana; *Parsnip*—Hollow Crown; *Pumpkin*—Small Sugar; *Cauliflower*—Snowball; *Potatoes*—Warba, Netted Gem and Early Ohio.

ESTABLISHMENT OF A FARM ORCHARD

Tree fruits of comparatively hardy varieties were planted on the Illustration Stations at Castor in 1939, at Metiskow in 1939 and 1944, and at Chedderville, Dickson and St. Paul in 1945. The material for trial came from the Dominion Experimental Station, Morden, Man., and the Provincial Horticultural Station, Brooks, Alta. Through experience, it has been learned that late spring frosts can be expected to injure the fruit blossoms in some seasons. Further, during some winters, all the tree growth above the snow level is killed back thereby discouraging the fruit grower. Crabapple varieties which have been reasonably winter hardy and have matured good fruit at the Castor and Metiskow Station in recent years are Osman, Dolgo, Transcendent, Olga, Florence, Robin, Columbia, Anaros and Garnet. Trial hybrid apple and the Sapa plum have produced fruit but are not sufficiently hardy to be satisfactory. The tree fruits planted at Chedderville, Dickson and St. Paul in 1945 included: *Crabapples*—Dolgo, Osman, Robin, Anaros; *Apples*—Spangelo, Hibernal, Breakey; *Hybrid apples*—Trail, Rosilda, Rescue and the Opata plum.

YIELD AND COST OF PRODUCING FARM CROPS

This investigation into farm costs is conducted with the general object of discovering ways and means of securing greater economy in the production of farm products. It is designed to help farmers to improve the organization of their farms through a wiser choice of farm enterprises and practices which tend to make such undertakings more profitable. The procedures followed in this study are so designed that all direct costs are charged to each enterprise concerned while general operating expenses which cannot be directly classified are allocated to all on the basis of relative capital investment. Hence, if wheat production constitutes the main source of revenue, it naturally follows that most of the general operating expenses are levied against this crop but, where a substantial investment in livestock is maintained that part of the farm organization receives a levy which is in proportion to the capital invested therein. It is found that there is close relationship between cost of any one

enterprise and the effectiveness of all other productive efforts within the individual organizations as they occur on station farms. In effect, these cost studies are in the form of single enterprise accounts and comprise a correlated part of the complete farm business studies which are conducted on the station units concerned. Table 38 summarizes the cost studies on cereal crops in the Lacombe supervisory district for a number of years.

TABLE 38.—SUMMARY OF CEREAL CROP YIELDS AND COST OF PRODUCTION

Station	Preceding crop	No. years grown	Average		
			Yield per acre	Cost per bu.	Cost per acre
<i>Wheat—</i>					
Castor.....	Summerfallow.....	9	15.7	0.57	8.92
Chauvin.....	Summerfallow.....	14	19.2	0.51	9.82
Metiskow.....	Summerfallow.....	9	13.6	0.57	7.76
Red Deer.....	Summerfallow.....	1	30.5	0.52	15.90
<i>Barley—</i>					
Chedderville.....	Hay and break.....	9	20.7	0.47	9.70
Dickson.....	Barley.....	9	41.7	0.27	11.31
St. Paul.....	Summerfallow	3	36.4	0.39	14.06
<i>Oats—</i>					
Fallis.....	Hay and break.....	5	68.0	0.22	14.92
Leslieville.....	Hay and break.....	1	56.2	0.38	21.39

Summerfallow is the most costly item contributing to the total expense of producing these grain crops. Variations in this cost follow closely the size of farm unit, the larger units having greater economy of machine use and man labour. Weeds also have an important bearing on this cost. Summerfallowing costs at Dickson and Red Deer are particularly high because of bad infestation of couch grass, wild oats and Canada thistle. The total cost of summerfallowing is lowest at Metiskow where the machine units are large and cover more land per hour. The highest cost occurs at Fallis where horses are still used. The average cost to summerfallow land at Metiskow is \$2.80 per acre, and at Fallis, \$7.09 per acre.

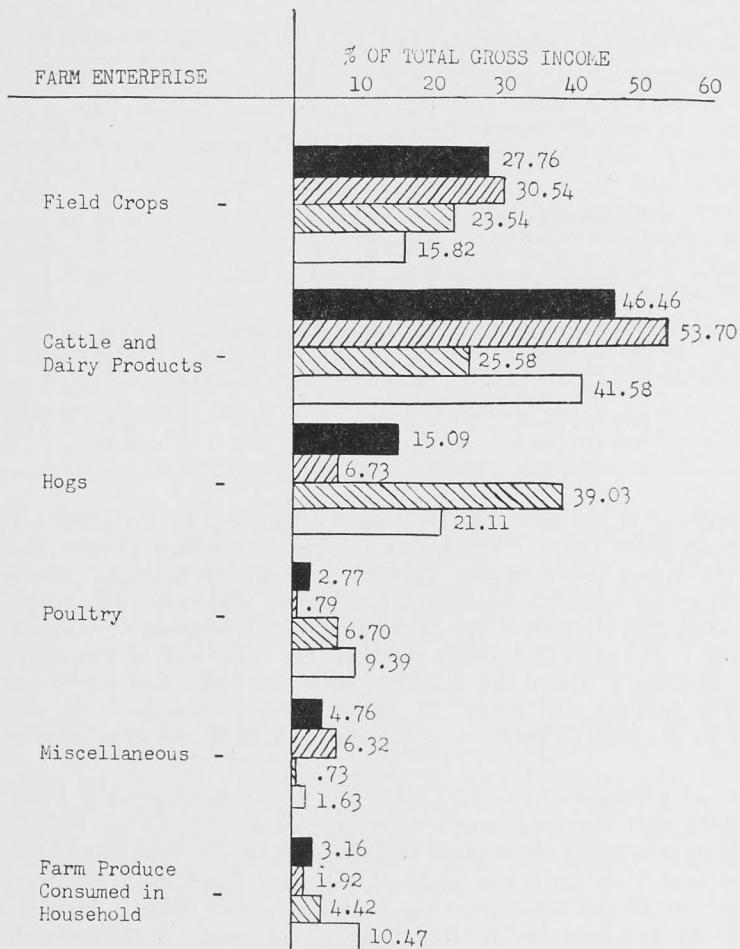
The cost of producing oats at Leslieville would seem unduly high were it not for the fact that the oats produced were a registered crop. Extra expense was involved in providing clean land, and the cost of the seed was much higher.

Cost per acre rises with the yield of the crop because of greater expense in harvesting, but at the same time the cost per bushel drops. This is demonstrated nicely by the data on the Red Deer wheat crop. A thirty-bushel yield brought the unit cost down to a figure which is favourable on comparison with the other wheat-producing farms.

FARM ORGANIZATION AND BUSINESS STUDIES

Crop rotations, soil management, land utilization, distribution of capital, investment per acre and subsidiary enterprises all have an important bearing on farm economy. Studies are conducted on eight stations in central Alberta to correlate these and other factors as they contribute to farm income. Station owners co-operate in sending weekly revenue and expenditure records. Purchases and sales are shown according to the various farm enterprises. At the end of each calendar year a complete inventory is taken, listing land use and crop yields, capital investments in land, buildings, livestock, machinery and equipment, feeds and supplies, accounts receivable and indebtedness. Although these studies have been conducted over a much longer period on some stations than

on others, it has been necessary, in obtaining comparable material, to limit the analysis to the three-year period 1944 to 1946, inclusive. Records have been grouped and averaged according to the three main soil and climatic zones occurring in central Alberta. In this way, certain inherent differences in farm organizations are shown. Some of the more important phases of this study are outlined below.



 - All Stations

 - Zone 2 Stations -
Castor, Chauvin, Metiskow

 - Zone 3 Stations -
Dickson, St. Paul,
Leslieville

 - Zone 4 Stations -
Chedderville, Fallis

This chart provides a graphic representation of farm organization in central Alberta as a whole and for the average type of farm in each of the three soil and climatic zones occurring within this territory. The Castor, Metiskow and Chauvin Stations are located on dark brown soils of the short grass prairie.

in Zone 2. Dickson, Leslieville and St. Paul represent the type of farm organization followed on the black loam and peat soils of Zone 3. The Chedderville and Fallis Stations represent farming on grey wooded soils in Zone 4.

Sales of livestock have been the main source of income for all stations during the period under study. While field crops accounted for 27.76 per cent of all farm income, sales of livestock totalled two and one third times as much, or 4.32 per cent. Sale of wheat is the main reason for the larger percentage of total income from field crops for stations in Zone 2. Zone 3 is more amenable to coarse grain production. Although grain yields on the black parkland soils are considerably higher than in Zone 2, more grain is marketed through livestock. Revenue from field crops on the grey wooded stations of Zone 4 is proportionately less. The acreage of grain crops is equalled by forage crops, and while some grain, hay, and clover seed may be sold, most of the crop is marketed through cattle, hogs, dairy and poultry products.

Hogs provided 15.09 per cent of the total farm revenue for all stations over the three-year period. The per cent of total farm income for all stations accruing from hog sales dropped from 16.94 in 1944 to 11.66 in 1946.

LAND UTILIZATION

A summary of the inventory records for the period, 1944 to 1946 inclusive, indicates that eight operators in this district of supervision own and operate 1,534 acres of land of which 4,655 acres or 49 per cent is under cultivation and 1,879 or 51 per cent is classed as native pasture, woods, roads and area required for the farmstead. For the average of the three-year period these eight stations grew 969 acres of wheat, 842 acres of oats, 308 acres barley, 83 acres fall rye, 15 acres flax, 778 acres forage crops, 374 acres improved pasture and 1,296 acres was summerfallow. Practically the entire acreage of wheat is produced by the Castor, Chauvin and Metiskow stations. A greater part of the barley, however, is grown on the stations located in Zones 3 and 4 and oats are grown to a considerable extent by all station operators. The fall rye yielded an average of 11.5 bushels per acre and was produced at the Metiskow Substation, where the soil is extremely sandy and subject to soil drifting. The acreage allocated to forage crop production has been on the increase in all zones in conjunction with the organization of systematic crop rotations. Fodder crops find a place on all stations, not only to supply feed for livestock but to aid in weed control in the rotations. Forage seed production is gaining in importance on the stations. Alfalfa seed has been produced on the Metiskow Substation and Altaswede red clover, white Dutch clover and timothy at the Winfield station. While the operators at Castor, Chauvin, and Metiskow have some improved pasture, they depend on native pasture areas in conjunction with the maintenance of their comparatively large herds of cattle which numbered 131, 118 and 117, respectively, in 1946. The acreage listed as summerfallow is confined largely to the stations located in Zone 2.

The average size and soil type of the eight station farms is representative of the majority of farms in the neighborhood in which they are located. The stations in Zone 2, namely Castor, Chauvin and Metiskow, have an average area of 2,611 acres with 48.3 per cent in crop land. These figures are indicative of the extensive nature of farming operations in the short grass prairie region. The Dickson, Leslieville and St. Paul stations located in Zone 3 have an average total area of 355 acres with 66.5 per cent crop land. These units are medium in size and production is more intense. The stations in Zone 4, located at Chedderville and Fallis, are much smaller farm units in comparison, having an average area of 212 acres with 26 per cent crop land but at the same time are representative of the grey wooded farms in central Alberta.

TABLE 39.—AVERAGE CAPITAL INVESTMENT, ACRES OF CROPLAND, AND GROSS REVENUE PER ACRE OF CROPLAND
CENTRAL ALBERTA—1944 to 1946

Station	Land and buildings		Livestock		Machinery and equipment		Total capital	Investment per acre crop land	Gross receipts per acre crop land
	Amount	Per cent of total	Amount	Per cent of total	Amount	Per cent of total			
<i>Zone 2</i>									
Castor.....	27,243.98	58.08	13,850.50	29.52	5,815.40	12.40	46,909.88	26.03	9.72
Chauvin.....	8,669.17	35.90	9,633.24	39.89	5,845.52	24.21	24,147.93	33.12	18.33
Metis River.....	11,348.32	43.24	8,275.96	31.54	6,617.02	25.22	26,241.30	20.99	9.19
<i>Zone 3</i>									
Dickson.....	5,887.90	62.43	1,690.58	17.92	1,853.65	19.65	9,432.13	102.52	29.85
Leslieville.....	15,598.58	71.59	2,723.00	12.50	3,466.25	15.91	21,787.83	71.20	16.04
St. Paul.....	10,410.64	62.69	3,440.04	20.71	2,756.25	16.60	16,606.93	53.40	19.25
<i>Zone 4</i>									
Chedderville.....	3,917.03	45.56	3,191.71	37.13	1,488.50	17.31	8,597.24	87.73	24.62
Fallis.....	2,862.49	61.80	1,190.83	25.71	578.58	12.49	4,631.90	69.13	32.54
Total.....	85,938.11	54.27	43,995.86	27.78	28,421.17	17.95	158,355.14	34.01	13.02
Average.....	10,742.26		5,499.48						

By study of land utilization, it is possible to measure the changes and adjustments that occur from year to year in the class of field crops grown and to determine a cropping program adaptable to soils and seasonal conditions for each district where an Illustration Station or District Experiment Substation is in operation.

FARM CAPITAL

Marked differences occur in the financial aspects of the stations in the three main soil and climatic zones. The average capital value of the farms in Zone 2 is roughly twice as much as the average of Zone 3 and five times as much as the average for Zone 4. The variation in the amount of capital invested between Zones is in direct proportion to the size of farm. On an average basis, the investment per acre of crop land in Zone 2 is about one-third that of each of Zones 3 and 4. The ratio of the percentage of the total capital invested in machinery and equipment, livestock, land and buildings for each of the zones is fairly consistent. The relative productivity of the individual Stations and of the farms grouped according to Zones is shown by the gross receipts per acre of crop land appearing in Table 39. Inventory records on these station farms for a three-year period show that on the average 54.27 per cent of the capital investment is in land and buildings, 27.78 per cent in livestock and 17.95 per cent in machinery and equipment. The average investment per acre of crop land amounts to \$34.01.

All these factors, occurring as they do in varying relationships, make it necessary that each farmer study his organization individually when instituting an improvement plan aiming at the greatest convenience, saving in labour and economy of production.

FIELD DAYS

Field meetings, held on the stations each year during the growing season, are featured as a means of acquainting farmers in the surrounding community with the work being conducted on the Experimental Farms and Illustration Stations. During the past eight years an aggregate of 11,411 people attended 69 meetings or an average of 165 per meeting.

LIST OF PROJECTS

ANIMAL HUSBANDRY

HORSES

- A 509 Breeding Clydesdale Horses.
A 882 Control of Equine Encephalomylitis.

BEEF CATTLE

- A 520 Breeding Shorthorn Cattle.
A 660 Serum Test For Contagious Abortion.
A 932 Calfhood Vaccination For Contagious Abortion.
A 93 Control of Tuberculosis in Cattle.

SWINE

- A 679 Advanced Registry Policy For Purebred Swine.
A 550 Strain Testing of Purebred Hogs.
A 919 Prepotency Testing of Boars.
A 858 Study of Fecundity and Nursing Capacity in Swine.

CEREALS

- I-Ce 1 Common spring wheat—Test of varieties or strains.
I-Ce 4 Winter wheats—Test of varieties or strains.
I-Ce 5 Oats—Test of varieties or strains.
I-Ce 6 Barley—Test of varieties or strains.
I-Ce 7 Field Peas—Test of varieties or strains.
I-Ce 9 Flax—Test of varieties or strains.
I-Ce 11 Winter Rye—Test of varieties or strains.
V-25 (a) Spring wheat breeding (General).
V-29 The production of superior varieties of oats.
V-30 The production of superior varieties of barley.
XIII Production of Foundation Stock and Registered Seed.
XIV-102 Investigation of varieties seeking licence.
XIV-62 Determination of varietal composition of farmers' samples.
XIV-
103 Verification of Foundation Stock Seed, Elite Stock Seed and
104 Registered Seed for C.S.G.A.
105
XIV-95 Cleaning of grain commercially.

FIELD HUSBANDRY

- F-228 Meteorological records.
F-107 Rotation "C".
F-130 Rotation "O".
F-126 Rotation "K".
F-142 Sequence of crops.
F-297 Cost of producing grain crops.
F-298 Cost of producing hay crops.
F-299 Cost of producing potatoes.
F-270 Degree of weed infestation.

F-511 (A)	Rates of applying fertilizer for wheat.
F-511 (B)	Rates of applying commercial fertilizer for wheat.
F-512	Commercial fertilizer formula for wheat.
F-541	Rates of applying commercial fertilizer for oats.
F-542	Rates of applying commercial fertilizer for barley.
F-543	Cultural treatments for hay crops.
F-544	Continuous crops.
F-545	Three-year rotations.
F-546	Four-year rotations.
F-548	Cover crop experiment.
F-562	Fertilizer formula for continuous crops.

FORAGE CROPS

Ag-1	Corn variety test for silage.
Ag-16	Field roots variety tests.
Ag-92	Triticum \times agropyron hybridization.
Ag-101	Seed production studies on grasses, legumes and other forage crops.
Ag-114	Red clover breeding.
Ag-126	Alfalfa variety tests.
Ag-146	Red clover variety tests.
Ag-161	Sweet clover variety tests.
Ag-201	Timothy variety tests.
Ag-231	White clover variety tests.
Ag-253	Brome variety tests.
Ag-264	Perennial and biennial grasses and legumes for hay.

HORTICULTURE

H-21	Strawberry, variety experiment.
H-102	Corn, variety experiment.
H-211	Tomatoes, variety experiment.
H-261	Annuals, variety experiment.
H-274	Perennial flowers, variety experiment.
H-298	Hedges, variety experiment.
H-307	Trees and shrubs, ornamental and shelter.
H-376	Ornamental evergreen, shrubs and trees.
H-793	Bush fruits, variety experiment.
H-795	Leguminous vegetables, variety experiment.
H-802	Perennial vegetables, variety experiment.
H-803	Root vegetables, variety experiment.
H-804	Leafy vegetables, variety experiment.
H-805	Vegetable vine crops, variety experiment.
H-815	Tree fruits, variety experiment.

POULTRY

P 110	Breeding for standard type and production.
P 56	Pedigree breeding for egg production.
P 114	Breeding for egg size.
P 115	Breeding for uniformity in eggs.
P 111	Breeding for fertility, hatchability, and livability.
P 134	Intestinal parasitism of fowl.
P 186	Bacillus pullorum infection of fowl.
P 235	Relationship of specific gravity of the egg to its hatching power and to chick livability.
P 261	The study of inheritance of hatchability in chickens.

ILLUSTRATION STATIONS

- IS—W1.00 *Rotations—West.*
 IS—W1.21 Fallow—Wheat.
 IS—W1.22 Fallow—Coarse grain.
 IS—W1.31 Fallow—Wheat—Coarse grain.
 IS—W1.33 Fallow—Wheat—Hay.
 IS—W1.52 Coarse grain—Coarse grain—Coarse grain—Hay—Hay.
 IS—W1.53 Coarse grain—Coarse grain—Hay—Hay—Hay.
 IS—W1.63 Fallow—Wheat—Hay—Hay—Coarse grain—Coarse grain.
- IS—02.00 *Soil Fertility.*
 IS—02.02 Plant food deficiency in grey wooded soils.
 IS—02.06 Plant food deficiency studies on peat soils.
 IS—02.10 The effect of chemical fertilizers on cereals.
 IS—02.12 Root fibre and crop residue in soil improvement.
- IS—03.00 *Cultural Methods and Practices.*
 IS—03.01 Control of weeds by cultural methods.
 IS—03.02 Control of weeds by chemicals.
 IS—03.05 Cultural treatments for summerfallow.
 IS—03.08 Strip farming as a control measure for soil drifting.
- IS—04.00 *Agricultural Engineering.*
 IS—04.02 Water development studies.
 IS—04.10 Testing new types of equipment and farm machinery.
 IS—05.00 Meteorological studies.
 IS—05.01 Study of regional climatic conditions as related to crop production..
 IS—05.02 Records of regional precipitation.
 IS—05.03 Records of regional temperature.
- IS—06.00 *Cereals.*
 IS—06.04 Introducing suitable varieties of cereals.
 IS—06.05 Testing cereal varieties.
 IS—06.06 Production of registered and pure seed grain.
 IS—06.10 Winter hardiness of fall seeded grain.
 IS—06.12 Testing field pea varieties.
- IS—07.00 *Forage Crop Studies (Hay Crops).*
 IS—07.01 Testing mixtures for hay or pasture.
 IS—07.08 Methods of producing seed of leguminous plants.
 IS—07.10 Inoculation vs. non-inoculation of legumes.
 IS—07.13 Adaptation of grasses and legumes to varying regional conditions.
- IS—08.00 *Pasture Investigational Studies.*
 IS—08.06 Pasture seeding and management studies.
- IS—11.00 *Horticulture.*
 IS—11.02 Stimulating interest in the development of the farm garden.
 IS—11.03 The establishment of a farm orchard.
 IS—11.17 Farm home beautification.
 IS—11.18 Farm shelterbelts.
- IS—13.00 *Livestock.*
 IS—13.01 Dairy cattle production.
 IS—13.05 Sales of livestock for breeding purposes.
 IS—13.06 Beef production.
 IS—13.07 Swine production.

- [S—14.00] Poultry.
- [S—14.01] Poultry production.
- [S—14.04] Sale of hatching eggs, pullets and cockerels for reproduction.
- [S—17.00] *Farm Management.*
- [S—17.01] Yield and cost of producing farm crops.
- [S—17.03] Study of farm productivity and progress.
- [S—17.04] Study of farm business.
- [S—17.07] Establishment of feed and seed reserves.
- [S—19.00] Publicity.
- [S—19.01] Field days.
- [S—19.02] Publications and presentation of results.

